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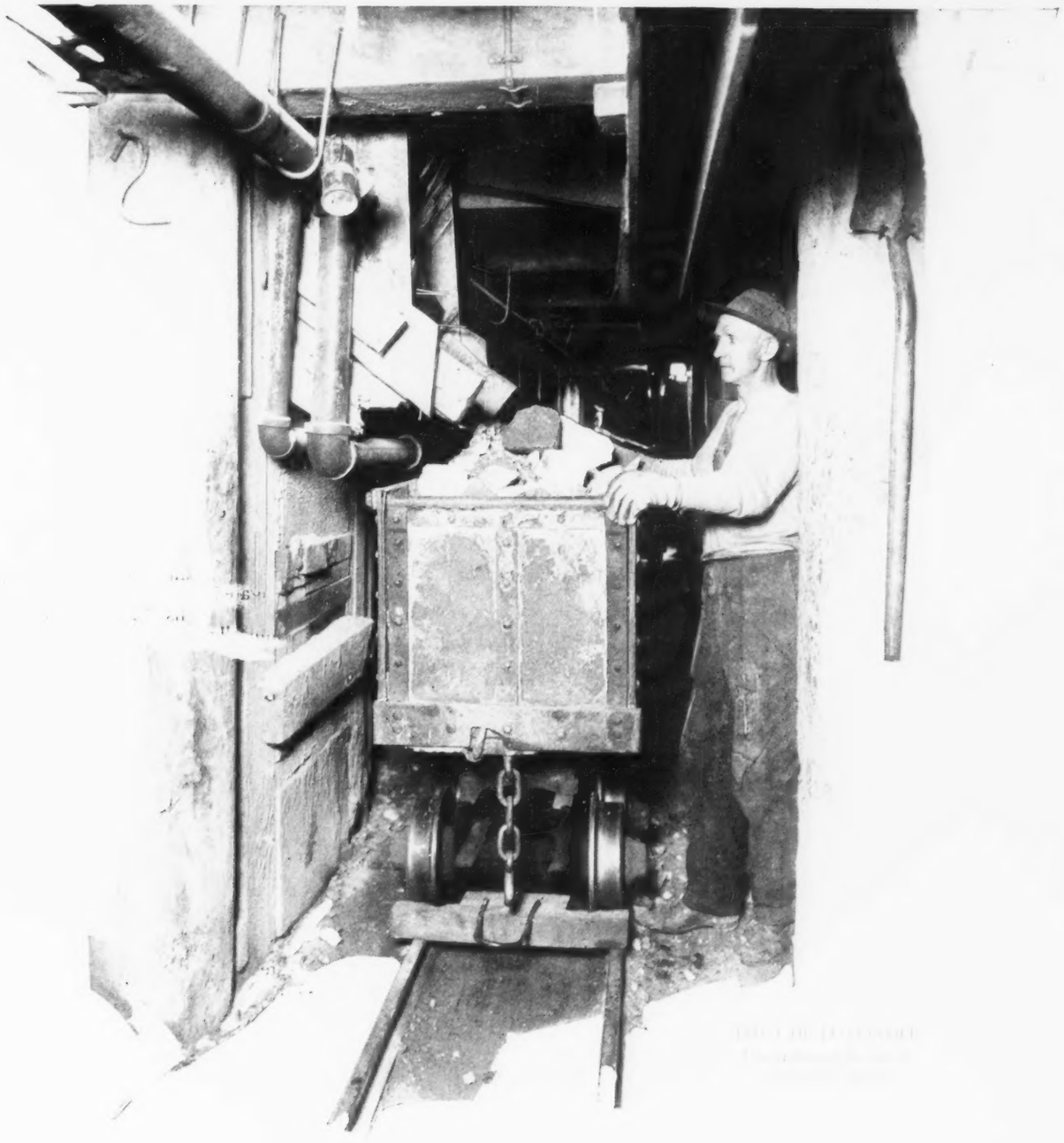
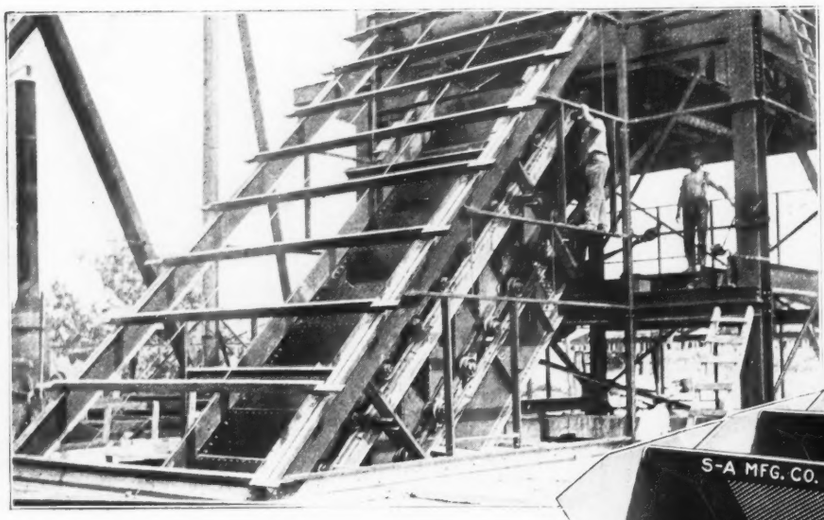


Dewatering Concentrates at Chino, by J. T. Shimmin

Brazil's Iron Ore Resources and Their Economic Importance, by Emilio Teixeira

Long-time Guarantees of Prosperity, by E. J. Mehren

What Is Engineering?



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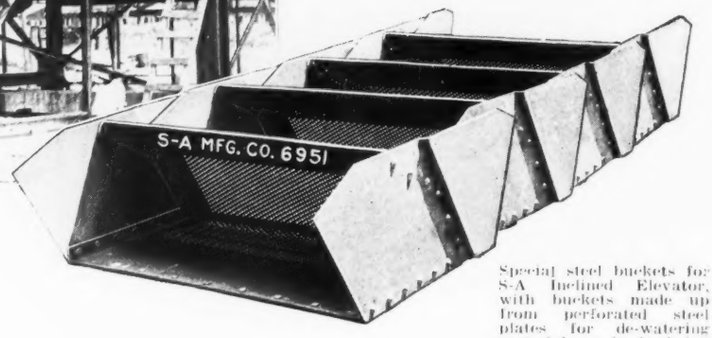

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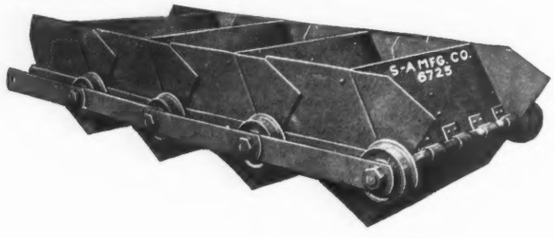

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ENGINEERING AND MINING JOURNAL

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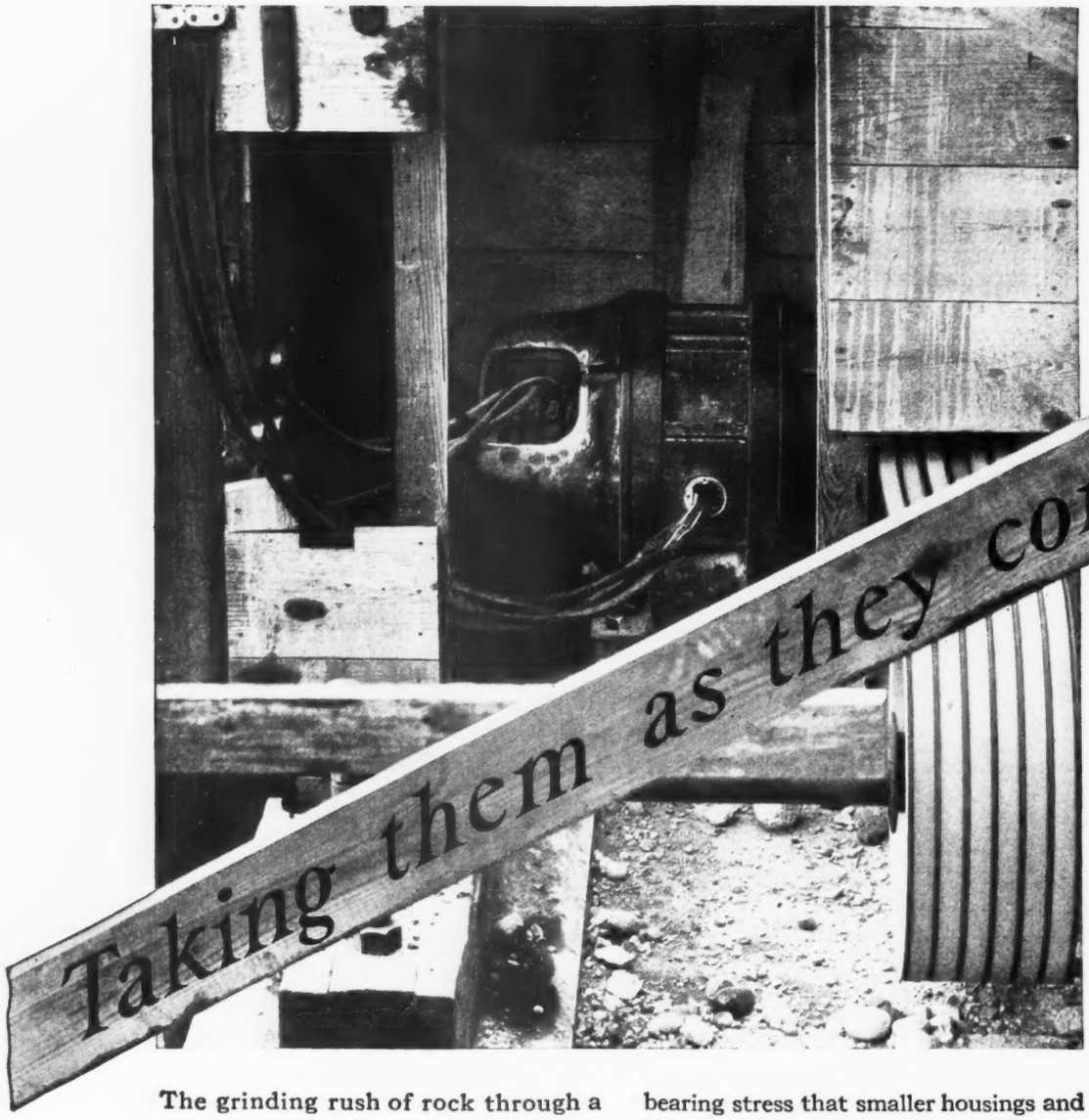

The rough wiring and set-up suggest that this motor is not favored by the best conditions. Allis-Chalmers Texrope Drive, an industrial sensation, particularly for short-center work, is here being used to belt a 50 h. p. Allis-Chalmers type ARV roller bearing motor to an Allis-Chalmers Gyratory Crusher.

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ENGINEERING AND
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McGraw-Hill Publishing Company, Inc.
JAMES H. MCGRAW, *President*

A. W. ALLEN,
Editor

VOLUME 124 — *New York, November 5, 1927* — NUMBER 19

What Is Engineering?

PERSISTENT EFFORT on the part of various agencies to evolve a definition of the word "engineering" that will withstand critical analysis by lexicographers, engineers, and, incidentally, the courts has been barren of fruitful result. Last year a committee was appointed by the Mining and Metallurgical Society of America to draft such a definition. The report of this committee was sent to each member of the Society, with an invitation to criticize, to submit amendments, or to propose a new definition. The response was unusually good; more than one hundred members wrote letters giving their views on the question; perhaps fifty offered definitions of their own, indicating a wide variety of ideas, as well as novelty in expression. The original proposal of the committee contended that "Engineering is the practical application of scientific methods to the utilization of the resources of nature, for the use of man."

To test this definition by the Socratic method one might say, "So this farmer, using average intelligence in the raising of wheat, is engaged in engineering." The implication that anyone is an engineer who produces something of utilitarian value, by the application of the principles of science, indicates the inherent weakness in the committee's reasoning. Other occupations pointed out by members as properly coming under the terms of the definition are fishing, lumbering, pharmacy, locomotive firing, poultry raising, milking cows (with a machine, of course), and obstetrics. The chief criticism advanced seems to be that the definition is too broad: that it requires drastic qualification. On the other hand, several were able to point to special occupations, generally considered as coming under the category of engineering, that are left out in the cold by the proposed definition. Railroad construction, surveying, mine sampling, geophysical prospecting, for example, are viewed by some as being excluded. Of course, much depends upon the manner in which the individual interprets the meaning of the words used in the definition. It is contended that something should be said to reflect the "economic aspects" of engineering; and no less than a dozen other ideas are suggested as being suitable for incorporation in a valid definition. At the same time, only a few of the words in the committee's offering have escaped adverse comment or caustic criticism.

Colonel P. E. Barbour, the secretary of the Society, after studying the mass of correspondence on the subject, has framed a definition that he hopes has avoided most of the criticisms advanced, and in which he has incorporated many of the ideas of various students of the subject. He does not claim that he has evolved a perfect definition; he submits it to the Society for further discussion and it probably will withstand valid attack better than any other proposed to date. It reads: "Engineering is the judicious application of the technical sciences to the human solution of inanimate mechanical problems."

On page 735 of this issue will be found Colonel Barbour's analysis of the various words, and a statement of his reasons for using them. Any engineer who considers it an easy matter to set down in black and white a concise statement that will describe his profession comprehensively, and at the same time exclude a score of other useful groups of society, might try to improve upon this latest attempt to determine a vexed problem.

An International Tin Cartel

FREQUENTLY in the past when prices for tin have shown a tendency to sag for a considerable period, rumor has insisted vigorously that an international cartel was about to be launched with the object of bolstering the market. The price of tin per ton in London has fallen £50 in six months, and half of this decline took place in six weeks. Consequently, little surprise was occasioned in the tin industry when the New York *Times* on Oct. 17 published a copyrighted story giving, in circumstantial detail, reports of a plan originating in London to establish a cartel of this character. "United States producers," according to the account, are to have a participation of not less than 25 per cent, the remainder being represented by British and Dutch interests. The plan provides that the price shall be pegged at approximately £300 per long ton, or about 65c. per pound for a period of three years. The scheme is evidently modeled after the Stevenson plan for the regulation of the rubber market—which incidentally has not been an unqualified success, chiefly because of the unwillingness of the Dutch producers to co-operate.

Cursory examination of the situation reveals many difficulties that would be likely to develop if a scheme of this kind materialized. The seemingly obvious objection that the anti-trust laws of the United States would stand in the way of success is based on a misconception. The so-called American interests must comprise Messrs. Guggenheim Bros. and Patiño Mines & Enterprises. Although it is true that the Patiño company is incorporated in the State of Delaware, not more than 15 per cent of the stock is owned in the United States, and it would be comparatively easy to make such readjustments as might be necessary to take the activities of the company out of the jurisdiction of Washington. It is probable that the Guggenheim interests would prefer to remain outside of any trust as a matter of policy; although, if they wished to join, it might be contended that, their tin mining operations being exclusively in Bolivia and the Malay States, they should be exempted from the pro-

visions of United States laws. In any event the production of the Guggenheim companies is only a small proportion of the total.

Of the world's production, the Malay States accounts for about one-third, and the Dutch East Indies and Bolivia each slightly less than one-fourth. China, Siam, and Nigeria are the next most important, each with about 5 per cent of the total. Most of the mine production from the Malay States is controlled by the British; and, through ownership of the smelters, dominance doubtless prevails over the independent Chinese producers. The Dutch output is controlled entirely by the Netherlands government, whose policy has always been to operate so as to insure an annual income from the tin mines. This government is not likely, according to those best informed, to enter into any agreements that would decrease this income even for a short time. In Bolivia only about half of the production comes from the two leading interests—Patiño and Guggenheim—thirty or more small producers contributing the remainder. Presumably it would be difficult to get concerted action, many of the interests being Bolivian rather than British, even assuming that the Patiño company would enter a "trust." Not fewer than twenty different companies are producing in Nigeria, though these are predominantly British.

The success of a plan to fix the price of any important commodity at an artificially high level depends upon the participation of the producers of an overwhelming proportion of the world supply. Otherwise the group attempting to exercise control finds that the "independent" producers increase their production so as to reap in still greater measure profits from the higher market prices that the cartel maintains by limiting the supply. The tin position is further complicated by the large volume of speculative trading. However, in the long run, the relation between production and consumption will be the big factor. Recent cable dispatches indicate that the story published in the *Times* had little basis in fact; nevertheless, although it is conceivable that an attempt to control the price may be made, the disinterested observer cannot see much likelihood of a successful outcome.

Information for a Lady —and Others

A LADY, whose letterhead bears evidence that she holds a responsible position in a field not allied to mining and whose diction indicates that she is a person of intelligence, writes for an opinion on two mining stocks. These two stocks are being ballyhooed by a certain pseudo-financial paper of Boston, a city where erudition sometimes runs amuck. "I realize that there is danger in listening to such advice," says the writer, but she is anxious to know if the mines really have any good showings of ore. "The prices have continually risen on their assertion that wonderful developments are going on."

Now, it makes no difference if one of these mines contains a lot of ore, even of high grade; and it makes no difference if plenty of money is being spent on its development. The purpose of the financial footpads who promote these stocks is to sell a large number of shares at a constantly increasing price, buying back such shares as they have to in the meantime, and then when the bubble shows signs of bursting, to remove their support overnight, allowing the stock to seek its true level. If the mine has good possibilities, more local interest is thereby aroused, and the easier it is to sell stock. If, to the amazement of its promoters, the mine proves to be profitable of itself, a reorganization can usually be effected whereby the insiders secure the cream. If this is not possible, the stock can usually be boosted far beyond its true prospective worth and all the shares unloaded. The mine may be good, bad, or indifferent, but the sucker who buys the stock loses nine times out of ten. Why ask, then, about the tonnage of ore developed? Better inquire concerning the financial standing of the promoters, how many shares are being issued (usually difficult to discover), and how the market price of the company's securities compares with a fair valuation of the mine's prospects.

This journal has found it advisable to publish little or no information about the work going on at mines being promoted under auspices that it knows to be questionable —and it usually learns suspicious circumstances early in the "game." Good ore may be developed, even a mill built, and perhaps production attained for a time, but too many reputable properties are better worthy of space in our columns. "'A large tonnage of $10 ore discovered' says the *Engineering and Mining Journal*, world's greatest authority on mining," would be fine bait for the unwary. Even though the statement were true, it would be embarrassing to be quoted thus.

Automatic Diagnosis of Car-Track Ailments

AN IMPORTANT FACTOR in the winning of metals and minerals is the efficient transportation of the raw and waste material in cars, inside and outside the mine, to and from the quarry and waste pile, and between the plant and the residue or slag pile. The scale of such operations at many mining properties parallels in importance that of a small- or medium-sized railroad; and in some instances the mining company operates one or more standard-gage railroads in incessant activity. Modern and suitable rolling stock is essential if the lowest operating costs per ton-mile is the aim, which usually is the case. But what of the track?

For maintenance of way, adjustment, and repair it is usual to rely on a warning conveyed by accident and delay, and to the periodic reports of an inspection gang. But too much attention cannot be paid to the recommendation that the personal element should be displaced if possible in favor of that accuracy and impartiality of decision with which a machine operates and by which a tell-tale record may be obtained. A suggestion of value and interest to those concerned with efficient transportation in the mining industries may be seen in the recent application of an idea proposed by Mr. C. F. W. Felt, chief engineer of the Atchison, Topeka & Sante Fé Railroad, and developed by the Sperry Gyroscope Company, of Brooklyn, N. Y. A car is equipped with an automatic recorder, by which a continuous chart is obtained indicating the condition of the track. All engineers are familiar with instruments that record changes in temperature, pressure, vacuum or specific gravity; but the Felt-Sperry apparatus registers the "spread" or "pinch" of the rails, the elevation of the track at curves, the tilt of the car, and the condition of rail joints. It

provides an automatic record of the condition of the roadbed and rails in such a manner that no further diagnosis is needed before prompt action may be taken to remedy a fault that might if neglected result in accident, delay, and disorganization.

Efficient operation and reasonable security necessitate a definition of the ideal. Doctor Sperry and his associates have shown how it is possible to depict in graphic form not only the ideal but the attainable in track conditions; and the occasional comparison of charts is all that is needed to indicate with mechanical accuracy the precise section of line needing attention in order to maintain the standards set. Continuity of output depends in large measure on the avoidance of the personal element in the detection of abnormal conditions. Accidents are seldom anticipated, but hazard may usually be reduced by the substitution of an unthinking recording mechanism, which neither forgets, procrastinates, nor misleads by false mental deduction.

An Opportunity for Local Mining Associations

REQUESTS for information about mining securities continue to be a feature of the morning mail. For instance, a letter from an Arkansas subscriber asks if, in our opinion, the current dividend of a Utah lead-silver company "is reasonably safe at the present low price of lead and silver," and adds, "is the company managed by experienced and honest officials?" As to the continuance of dividends it is unwise, of course, to venture an opinion without an intimate knowledge of the company's affairs.

Questions like these again bring up the need of some kind of financial service available to those who have small sums to invest. General advice is freely given not to put money in a company without keeping in close touch with its affairs; yet usually the only sources of information are incomplete company reports, published at infrequent intervals, and the propaganda of interested brokers, who always advise buying, but never recommend selling. The technical press permits one to keep in touch with the news of what a company is doing from an operating standpoint, but this is of little help in judging the value of the company's securities. Local chambers of commerce, mining associations, state bureaus of mines, and similar organizations might develop facilities that would be of great value to the small investor, in giving unprejudiced information concerning companies in their territories. Such information need not be in the nature of a definite recommendation to buy or sell certain securities, but would rather be confined to detailed statements of current operations and earnings, and ore reserves, with the business records of the management and backers of the enterprise. In other words, information should be available that would give a prospective investor sufficient material on which to base an intelligent opinion as to the value of the stock at the prevailing price and dividend rate, if any.

If an unprejudiced organization is prepared to extend such a service, the *E. & M. J.* will be only too glad to make the fact known. Such a local chamber, if not of the local "booster" type, might easily attain a national reputation and thus attract a considerable amount of money for mining investments in the territory it represents.

The Stockholder Pays

SERIOUS ATTENTION should be given to the reduction in the corporation income tax, which is now about 13½ per cent. It is said that the present rate of tax has been bringing into the federal treasury more money than was received when the 12 per cent corporation income tax and the corporate stock tax were in operation. A large surplus is also said to have been accumulated. Individuals and partnerships now pay about 5 per cent. As corporations are nothing more than large groups of individuals who have invested their money for a common purpose, it would appear that discrimination of considerable degree is shown by and between groups of the same kind but differing in size and organization. This patent inequity should be remedied.

The stockholder in a corporation is subject to three forms of taxes: the federal corporation income tax, the local and state taxes paid by the corporation—subtracted from the corporation's earnings and therefore in effect paid by the stockholder—and personal property taxes. In the aggregate the levies amount to a considerable sum, sufficient in some instances to deter investment in the stocks of certain corporations.

The stockholder of a corporation is an important element in the general welfare of the industrial community, whether he resides there or elsewhere. Some states—as, for example, California—exempt their citizens from personal property tax on holdings in local corporations. This is in recognition of the influence of such corporations in advancing the prosperity of a state. It would thus appear that as the corporation advances industrial welfare and insures employment of a portion of the population. the interests of its stockholders should receive fair and equitable treatment.

Another Cut in Aluminum

AGAIN the Aluminum Company of America has cut prices on all grades of ingot by one cent a pound, and consumers wonder why. Only last January a similar cut was made. Why should the company present its customers with a reduction of $20 on every ton? Two possible reasons for this voluntary sacrifice suggest themselves. The first is that recently the demand for aluminum has been rather light. Under scrutiny, however, this explanation is hardly satisfactory. All things considered, little difficulty should be experienced by the company in selling its entire output at its price.

The second possible cause already has been hinted: the threat of competition by Germany on a greater scale than heretofore. Rumor had it, a few weeks ago, that the Aluminum Company was seeking to arrive at an understanding with the German aluminum interests. Then came another rumor saying that a hitch in the negotiations had occurred. Close on the heels of this report comes the present cut of one cent a pound. The reduction certainly is not made in a spirit of benevolence to consumers. It may be an attempt to stimulate the domestic market. At the same time it has the aspect of a missionary effort put forth to win the Vereinigte Aluminum Werke and the German government to the Aluminum Company's way of thinking and thereby produce complete harmony in the aluminum world.

America Must Prepare to Meet the Industrial Challenge of Europe

EIGHT HUNDRED AND FIFTY years or so after King Canute attempted and failed to stay the ocean tides, the Congress of the United States essayed a similar gesture, on this occasion against fundamental economic law, by enacting a statute known as the anti-trust or Sherman Act, which had its genesis in the widespread conviction that an industrial combination was inherently inimical to sound business development and the public welfare. Thirty years' experience with this law and with its amendments and its offspring, the Clayton Act, should have afforded a conclusive determination as to its value to industry and to society. Analysis has been evaded, and the time has now arrived when further procrastination must inevitably be disastrous in its effect on the people and the industries of this country. Authentic reports from overseas indicate the elaboration of a comprehensive business plan, threatening to develop into a world challenge to our industrial supremacy, that aims to take every advantage accruing from the establishment of commercial alliances, cartels, and trusts. Thus an instrument of business that has been despised and rejected in this country during three decades is to be adopted by Continental Europe to secure dominance in world trade.

GOVERNMENT interference with industrial evolution, by the erection of artificial barriers, merely inhibits those developments that are based on fundamental and inevitable laws of creation and growth. The United States must face the fact that, in the opinion of the world, in the judgment of the peoples of other nations, combinations of capital and skill are not in themselves immoral or unmoral. Such combinations deserve and will attain complete justification if compelled by government regulation to serve the general, national, and individual welfare. Other nations are proving that such regulation is practicable. The American thesis insists that the trust or trade combination is in itself evil. The industrial leaders of Europe, supported by their governments, believe that it can serve a high and useful purpose; that it can even be made to retrieve catastrophic military disaster and political failure; that through its instrumentality—developed and directed by skill and experience; checked and controlled by law—the proponents and sponsors may prevail in the markets of the world. And, led by a reborn Germany, shorn of her expensive and useless armor but still imbued with an unconquerable Teutonic spirit, the challenge comes to the United States to enter a world conflict for supremacy in producing and marketing chemicals, steel, and every commodity that scientific research and government subsidy, that controlled manufacture and distribution under cartel management and exploitation, can effect.

A DISPASSIONATE and honest review of events in the last three decades of industrial development in this country finds no justification, in terms of achievement, for the Sherman Law or for the Clayton Act. "Trusts" have been broken, it is true; but, whatever the opinions expressed in the village grocery or at the round tables of ten thousand directorates, the conclusion of the United States Supreme Court—that the actual though not always apparent coalescence of the scattered units would be difficult to prevent—has been overwhelmingly confirmed by obvious fact. The dissolution of industrial affinities cannot be effected by statute. Men, associations, governments, and states having common objectives and identic problems in regard to public welfare, industrial development, or national integrity and expansion, combine in obedience to as basic a social and economic law as that which in nature causes the union of the chemical components of water. An unfettered law will control and direct the evolution of human and industrial relationships as inevitably and as inexorably as it rules in the realms of chemistry and physics. The Sherman Act purported to prevent undesirable combinations, but it has merely hindered legitimate co-operation, especially in the mining industries. Natural selection may be suppressed by law; but if unhampered thus, certain orderly, logical and inevitable forces proceed to control and direct the evolution and development of artificial and man-made creations, such as state and industry, as well as of living matter.

THE mining industry in the United States, an industry of supreme importance to advancing civilization, is functioning in a fashion so imperfectly that those responsible for production and marketing have cause for legitimate complaint. In a period of unparalleled prosperity, when the manufacturers of commodities of all kinds and the purveyors of services in infinite variety are able to command a satisfactory and adequate return on investment, the miner is compelled to sell his product at so close a margin of profit—when there is any—that demand for government aid in some form is being made with cumulative insistence. Modification of the Sherman Act by alternative interpretation affords a slight measure of relief with respect to export business, but is without effect on the domestic situation. Exports of copper were larger in June last than in any month since the war; nevertheless, and despite the fact that the United States exported in the first six months of 1927 over one hundred million pounds more than was exported in the same period in 1926, the domestic price, although reflecting a profit for most of the large producers, is considered by the industry at large as inadequate and unsatisfactory. And large producers must subsidize research and introduce such improvements as are necessary to advance the technical, social, and economic conditions in the industry.

COMBINATION and co-operation are necessary to meet the menace of an organized attack from group consolidations. Mr. Henry Wickham Steed, the distinguished British publicist and journalist, predicted on October 21 an industrial United States of Europe. This warning, taken in conjunction with the observation, on the same date, of that venerable and straight-thinking American, Mr. Thomas A. Edison, that a government should not carry its functions beyond the *regulation* of business, suggests that official intervention should be confined to what is constructive, helpful, and benevolent; and that government influence should not be used for the purpose of forbidding and preventing the orderly progress of forces beyond the control of statutes and of the politicians who devise them. American industry has vastly increased its zone of influence in foreign marts since the passage of the Sherman Act—a measure designed to curb illegitimate combinations at home and to protect the domestic consumer, but at the present time the greatest hindrance to a united front in the face of a mass industrial attack from abroad. A reconsideration of the effect of anti-trust laws on national prosperity is the urgent need of the hour.

Electric Haulage in Montana

Loading an ore train in Butte. It will be hauled by electric locomotives to the smelter at Anaconda

Photos by Ewing Galloway, New York

An ore train on the Butte, Anaconda & Pacific Railway, en route from Butte to Anaconda, crossing an ordinary freight train on the Chicago, Milwaukee & St. Paul Railroad

The Chino mill of the Nevada Consolidated Copper Company

Dewatering Concentrates at Chino

By J. T. SHIMMIN

Formerly Superintendent of Mills, Nevada Consolidated Copper Co., Chino Mines, Hurley, N. M.

THE MILL of the Nevada Consolidated Copper Co., New Mexico division, Chino mines, is situated at Hurley, N. M., at an elevation of 5,700 ft. above sea level. Milling practice includes both gravity and flotation concentration, the gravity section of the plant being operated intermittently, depending upon whether or not the native copper content of the mill feed is sufficient to warrant its operation. The ore contains a considerable amount of pyrite and chalcocite, both of which, after flotation, tend to segregate from the pulp and to settle rapidly, forming a hard and compact sludge. Continuous vacuum filters are used to dewater the flotation concentrates afterthickening, and a great deal of difficulty was encountered with them owing to the segregation of pyrite and chalcocite in the filter tanks. In this article I shall describe the filtration problem which confronted us, the steps which we took to solve it by making changes in the existing equipment, and finally the development at Chino of a new type of filter which not only demonstrated its ability to handle the flotation concentrates with ease, but also handled a mixture of flotation and table concentrates. Before proceeding with an account of the filtration problem, I shall briefly describe the flow sheet at Chino and the equipment used.

Fig. 1 shows a diagrammatic flow sheet of the Chino mill with a legend of the equipment used. Ore is received at the mill in trains of twenty-eight railroad cars each, and is dumped through 12x12 in. grizzlies, situated under the tracks, into two coarse ore bins. The coarse-crushing department comprises three units—one a remodeled unit that was put in operation last March—and consists essentially of cone crushers and rolls in closed circuit with vibrating screens. The remodeled unit in the coarse-crushing department reduces the ore fine enough to pass $\frac{1}{2}$x$\frac{3}{4}$ in. rectangular openings of Hum-mer screens.

The fine-crushing and fine-grinding department is divided into six individual sections, five of which are equipped with two sets of Garfield rolls and one section of which is equipped with a rod mill. All fine crushing and grinding is done at a dilution of 2.66 tons of water per ton of ore, the material remaining in closed circuit until fine enough to pass standard 10-mesh Chino vibrating screens. The screen undersize flows to a Dorr hydro-separator, the overflow of which, containing 29.6 per cent of the original feed at 5.2 per cent plus 100 mesh and 13 per cent solids, goes to a central flotation feed distributor. All of the hydro-separator underflow, representing 70.4 per cent of the total tonnage, and containing 69.4 per cent plus 100 mesh and 46.5 per cent solids, is sent to the gravity concentration distributor.

The gravity concentrating department consists of twelve Deister tables, which, as stated before, operate only when the ore contains native copper. When they are operating, the average table concentrate tonnage is 24.28 per cent of the total concentrate production. The concentrate is dewatered to approximately 6 per cent moisture content in two Dorr classifiers equipped with vacuum bottoms; it is then conveyed directly to railroad cars. The table tailings are pumped to Dorr bowl classifiers operating in closed circuit with ball mills; overflow from the bowls, which passes to the flotation feed distributor, is 14.4 per cent plus 100 mesh and 19 per cent solids.

The flotation department consists of five sections, each being equipped with eight rows of locally designed pneumatic machines. Each row consists of six rougher cells in series, two first cleaner cells in series, one second

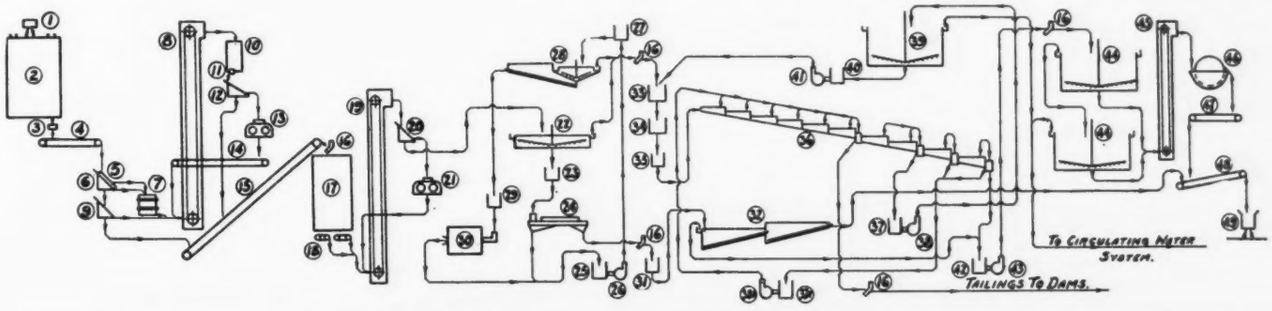
cleaner cell, and one third cleaner cell. A central distributor divides the flotation feed equally among the five flotation sections, each section being further provided with a feed distributor to divide its feed among the eight rows of machines. The tailing from the sixth rougher cells, containing 78.94 per cent water, flows through pipe lines to the tailing dams. Of the water in the tailing 91.6 per cent is recovered for re-use in the mill.

Concentrates from the third cleaner cells are pumped to a Dorr thickener, from which they are withdrawn—at approximately 70 per cent solids and 30 per cent moisture—and fed to the filter plant. The filtration equipment consists of four 14x14-ft. external drum type filters of standard make and one 14x14-ft. specially designed internal drum filter which is locally referred to as the Shimmin filter. The filter cake is conveyed direct to railroad cars, where it joins the table concentrates and is shipped to the smelter of the El Paso Smelting Works at El Paso, Tex.

Returning to the filtration problem, the main difficulty encountered in the filtering of the flotation concentrates was the tendency of the heavy native copper concentrates to pack under the filter drums to such an extent as to stall the machines. It was frequently necessary to raise the drums out of their tanks to clean out the accumulated solids. The segregating tendencies of the concentrates were largely influenced by the consistency of the feed to the filters—the denser the feed, the less the segregation, counteracted by such careful attention to the minor details of pulp handling as to make continuous operation of the filters subject to delicate control.

The more I studied the factors governing filtration of this difficult concentrate, the more did I feel that a filter could be constructed in such a way as not only to handle Chino concentrates without trouble from the quick-settling native copper ore, but also actually to benefit by pulp segregation. The basic idea was a continuous rotary vacuum filter with the filter medium applied on the inside of the cylindrical drum in very much the same manner as liners are secured in a ball or tube mill. One end of the drum was to be closed, the other end would be open with the exception of an internal flange to retain the pulp within the shell during filtration. The advantages of a filter constructed in this way appeared very great when considering the tendencies of Chino flotation pulp.

In the first place, the filter tank was done away with entirely. Second, the troublesome quick-settling particles in the pulp would settle by gravity directly against the filter cloth where we wanted them. Other contributing advantages were the elimination of agitators and air jets, the ease of starting up after a shutdown with a full load, the ability to handle feeds varying widely in moisture content and screen analysis, and the fact that the layer of relatively coarse material over the filter medium would tend to keep the fine particles from



LEGEND OF EQUIPMENT —— NUMERICAL NOTATION.

Mk.	No.	Description - 1 Section Coarse Crushing Department.
1		55 Ton Ore Cars.
2	2	Coarse Ore Bins. Serve 3 Sections.
3	19	Steel Apron Feeders.
4	1	34" Belt Conveyor.
5	1	3'-10"-3'-0" Grizzly. 2½" Opening.
6	1	4'-6"-6'-0" Chino Screen. ⅝"-1¼" Openings.
7	1	7 Ft. Symons Cone Crusher.
8	1	36" Bucket Elevator.
9	1	Type 33. 4'-5' Hummer Screen. ¼"-⅜" Openings.
10	1	Surge Bin.
11	1	4-Pulley Type Feeder.
12	4	Type 33. 4'-5' Hummer Screens. ¼"-⅜" Openings.
13	1	72"-20" Garfield Rolls.
14	1	42" Belt Conveyor.
15	2	36" Incline Conveyors. Serves 3 Sections.
16		Automatic Electric Samplers. Cutting Every 8 Minutes.

Mk.	No.	Description - 1 Roll Fine Crushing, Fine Grinding & Gravity Concentration Section.
17	2	Fine Ore Bins.
18	4	Steel Apron Feeders.
19	1	38" Bucket Elevator.
20	8	Chino Impact Screens.
21	2	42"-16" Garfield Rolls.
22	1	20'-3½" Dorr Hydro Separator.
23	1	12-Way Table Feed Distributor.
24	12	Deister Triple Plat-o Concentrating Tables.
25	1	6" Wilfley Pump Sump.
26	2	6" Wilfley Pumps. - 1 - Operating.
27	1	2-Way Distributor.
28	2	Dorr Model D.S.D.B. 8'-26'-8'-15' Bowl Classifiers.
29	1	3-Way Distributor.
30	3	7'-10' Chino Ball Mills. 13.3 R.P.M.
31	1	2-Way Distributor.
32	2	Dorr Model C. Tandem Classifiers. Vacuum Bottom. Serving 6 Sections.

Mk.	No.	Description - 1 Section Flotation Concentration Department.
33	1	5-Way Primary Flot. Feed Distributor. Serve 5 Sect.
34	1	5-Way Secondary Flot. Feed Distributor. Serve 5 Sect.
35	1	8-Way Distributor.
36	8	Strings Chino Flotation Machines.
37	1	8" Wilfley Pump Sump.
38	4	8" Wilfley Pumps. Serve 5 Sections. 3 Operating.
38A	1	8" Wilfley Pump Sump.
38B	2	8" Wilfley Pumps. Serve 5 Sections. 1 - Operating.
39		Dorr Thickeners.
40	1	8" Wilfley Pump Sump.
41	2	8" Wilfley Pumps. Serve 5 Sections. 1 - Operating.
42	1	6" Wilfley Pump Sump.
43	2	6" Wilfley Pumps. Serve 5 Sections. 1 - Operating.
44		Dorr Thickeners.
45	2	16" Bucket Elevators. Serve 5 Sections. 1 - Operating.
46	5	14'-14' Vacuum Filters. Serve 5 Sections. 2 - Operating.
47	1	20" Belt Conveyor. Serves 5 Sections.
48	1	26" Belt Conveyor. Serves All Sections.
49		55 Ton Rail Road Cars.

Fig. 1—Flow sheet of the Chino mill of the Nevada Consolidated Copper Co.

and vice versa. The thickener was operated in such a way as to give as thick a discharge as possible, but, even so, segregation continued, although not to as great a degree. Various attempts were made to counteract this segregating tendency by providing agitation within the filter tanks. Mechanical agitators were installed on all units and in addition air jets were used in the bottoms of the tanks. Under these conditions operation was carried along with a fair degree of success, but it was realized that segregation would have to be constantly becoming imbedded in the pores of the cloth. Another consideration was the fact that a filter of this type should be able to handle a mixed feed of both flotation and gravity concentrates, and deliver to the smelters a uniform mixture of dewatered concentrates which would greatly simplify sampling at the El Paso smelters and make the analyses determined from these samples far more representative of the car contents than formerly.

It was therefore decided to construct a trial unit to determine what could be expected from a filter of the

type described under Chino conditions. An internal type vacuum filter 13 ft. 1½ in. in diameter by 12 ft. 9 in. face width was built as shown in Figs. 2 and 3. On its interior surface the drum was divided into twenty-two sections, or panels, by wood strips bolted through the shell to secure the filter medium in place, thus making it possible to change the entire cloth, or any section of it, quickly. The shell proper was built of wood, lined with light steel, and with built-up sections, or panels,

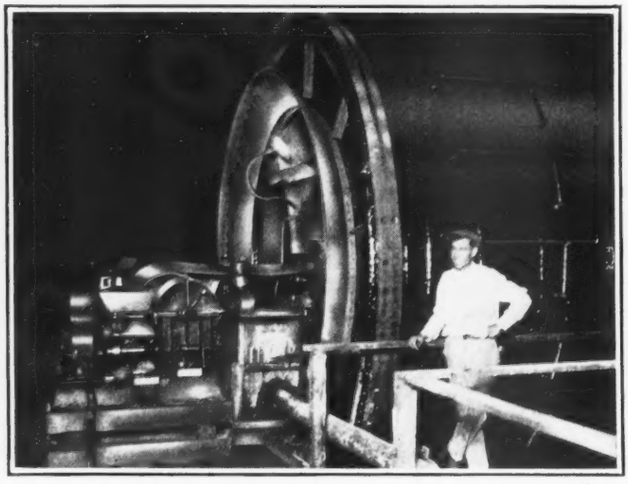


Fig. 2—The new internal type of the vacuum drum filter

on the inside. The main valve was placed at the closed end of the drum, with all pipe connections between it and the various panels on the outside of the shell where they would be easily accessible. A trunnion at the closed end supported the drum, which had a steel tire attached to the outside, near the open end, running on rollers secured to the baseplate.

Feed was introduced in a launder through the open end, and the cake was discharged from each panel in turn by giving the cloth a rapidly pulsating motion. This motion was produced by alternately connecting the panel with a compressed-air supply controlled by a pulsating valve driven from the countershaft. A steel hopper inside the drum received the cake as it was discharged, and a belt conveyor removed it, although future units will be equipped with a screw conveyor for the cake discharge. The filter was rotated by a worm and worm-gear drive. All auxiliaries, such as vacuum pumps, receivers, and traps, were of standard types.

The Shimmin internal drum filter was recently given a twenty-day continuous test during which the feed consisted of flotation concentrates dewatered in a Dorr thickener to 70 per cent solids. Tonnage samples, as well as samples for metallurgical purposes, were taken hourly; vacuum pump requirements were determined with a test gage; and integrating wattmeter readings of power input to the vacuum pump motors were recorded. Feed was sufficient to operate at full capacity. The screen analysis of a composite sample of the filter feed, and general data pertaining to the filter, follow:

Screen Analysis of Composite Filter Feed Sample

	Accumulative Per Cent
On 28 mesh	.2
On 35 mesh	.6
On 48 mesh	1.8
On 65 mesh	2.4
On 100 mesh	17.0
On 150 mesh	31.4
On 200 mesh	44.0
Through 200 mesh	100.0

Shimmin Filter Data

Size of filter	13 ft. 1½ in. x 12 ft. 9 in.
Number of panels	22
Effective width of panels	22½ in.
Area of each panel in square feet	23.86
Total blanket area in square feet	524.9
Filter medium (twill weave)	17 oz.
Method of cake discharge,	pulsations of filter medium

Power Consumption in Kilowatt-hours

Filter drive input	4.45
Vacuum pump input	10.10
Total power input	14.45

During the twenty-day test a mixture of 75 per cent oleic acid and 25 per cent pine oil was used in the flotation cells, the oleic acid producing a condition very similar to that obtained with reconstructed creosote and causing low filter capacity, owing to the slimy nature of the concentrates produced.

The tabulation which follows gives the average results for the test period while the filter was being operated at maximum tonnage. Feed during the test consisted of 74.72 per cent flotation concentrates plus 25.28 per cent of fine gravity concentrates overflowing the classifiers which dewater the coarse table concentrates.

Filtration Results With Shimmin Filter

Average tons filtered per twenty-four hours	120.13
Average moisture content of feed	34.53 per cent
Average moisture content of filter cake	12.00 per cent
Maximum tonnage filtered per twenty-four hours	153.70
Minimum tonnage filtered per twenty-four hours	77.06
Average tons filtered per square foot of blanket area per twenty-four hours	.2295
Average vacuum in inches of mercury	18.27
Average free air through filters in cubic feet per minute	145.27

Filtration Costs[a]

Repairs and maintenance per ton filtered	$0.0435
Vacuum cost per ton filtered	.0161
Filter driving cost per ton filtered	.00945
Total costs	$0.0691

(*a*) Operating labor is not included.

The figures given above show a very high capacity on Chino concentrates, considering the flotation reagents used, and a cake moisture content which compares favorably with filtration practice at this mill. The cost of dewatering concentrates—$0.0691 per ton—is very low.

After the Shimmin filter had demonstrated ability to handle Chino flotation concentrates successfully, it was decided to try it out with a mixed feed of both table and flotation concentrates. This mixture has such pronounced segregating qualities, owing to the coarse table concentrates, that it is extremely doubtful if it could be handled at all by any of the external drum type filters in the mill. Not only were these tests highly satisfactory, but, also, the capacity of the filter on the mixed feed was practically double that on straight flotation concentrates. The moisture content of the cake was lowered, and the structure of the cake was excellent, it being porous and made up of alternate layers of coarse and fine material.

To carry out these tests, the table concentrates were sent to an 8-ft. cone placed directly ahead of the filter,

Screen Test of Filter Feed Composed of Combined Concentrates

	Accumulative Per Cent
On 10 mesh	.4
On 14 mesh	1.8
On 20 mesh	3.4
On 28 mesh	7.2
On 35 mesh	12.2
On 48 mesh	20.8
On 65 mesh	30.6
On 100 mesh	50.8
On 150 mesh	63.0
On 200 mesh	67.4
Through 200 mesh	100.0

instead of to the Dorr classifiers which were used for dewatering this material in normal operation. The cone discharge flowed directly into the filter drum, the flow

of flotation concentrates remaining the same—that is, from the concentrate thickener into the filter. The coarseness of the feed is shown by referring to the screen analysis which appears on the preceding page.

Shimmin Filter Operating Data—Feed Consisting of Gravity and Flotation Concentrates

Average tons filtered per day	246.31
Average per cent of moisture in feed	40.00
Average per cent of moisture in cake	10.95
Average tons filtered per square foot of blanket area per twenty-four hours	.469

Operating Costs[a]

	Per Month	Per Ton
Repair, labor, and supplies, including mill overhead	$157.350	$0.0213
Electric power	92.174	.0125
Totals	$249.524	$0.0338

(a) Operating labor is not included—(part time of one man required).

The operation of the filter when dewatering combined concentrates was substantially the same as when handling straight flotation concentrates, the filter being able to handle its maximum tonnage of flotation material plus an approximately equal amount of concentrates from the tables. Although the dewatering of all concentrates on Shimmin filters would result in the elimination of the

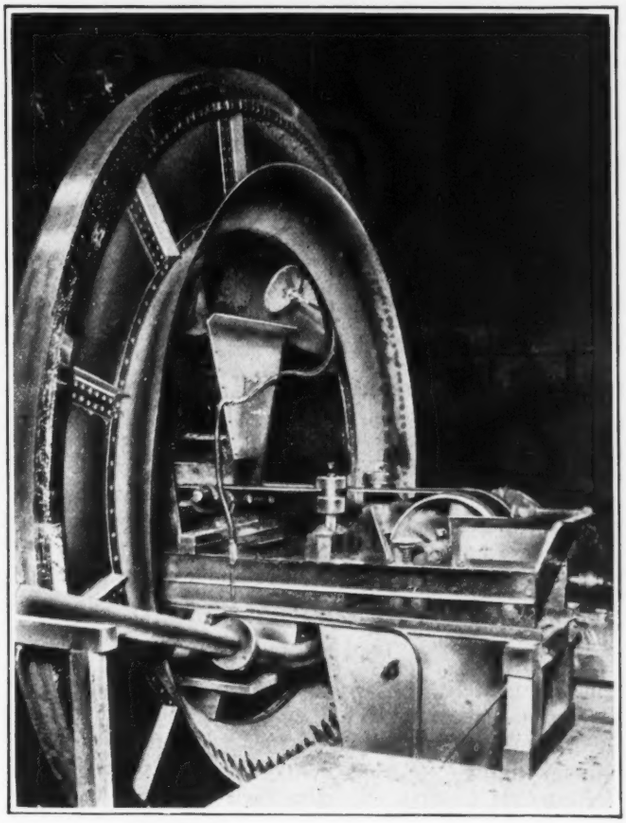


Fig. 3—Another view of the Shimmin filter

costs for dewatering the gravity concentrates with classifiers, and at the same time result in a much more homogeneous mixture of concentrates in the railroad cars, several other factors not directly connected with filtration still may make it undesirable, for the present, to change the current system of handling table concentrate.

Recently, the use of the oleic acid flotation reagent was discontinued, and a capacity test was run on the Shimmin filter with a concentrate which was relatively easy to filter. During a run of $36\frac{3}{4}$ hours the Shimmin filter handled the entire tonnage of flotation concentrates produced and gave an indication of the capacity which might be expected under favorable conditions. The table below gives the most important data obtained.

Shimmin Filter Operating Data—Feed Consisting of Easy-Filtering Flotation Concentrates

Total dry tons concentrate filtered (a)	820.80
Duration of test, hours	36.75
Total dry tons of concentrate filtered per twenty-four hours	535.90
Average moisture content of feed, per cent	29.16
Average moisture content of cake, per cent	9.07
Average tons filtered per square foot of blanket area per twenty-four hours	1.02
Average vacuum in inches of mercury	21.00

(a) Tonnage determined from actual scale weights of loaded cars.

A filter of the type described in this article will be used at each of the Ray (Ariz.) and McGill (Nev.) mills of the Nevada Consolidated Copper Co. This patented filter will henceforth be known as the Dorrco filter, as The Dorr Company is handling exclusively its manufacture and marketing.

U. S. Chamber of Commerce Considers Corporation Income Tax

A PROPOSAL that the rate of corporate income tax applicable to net income of 1927 should not exceed 10 per cent was submitted recently by the Committee on Federal Taxation at the West Baden (Ind.) meeting of the U. S. Chamber of Commerce. The report points out that the national Chamber by resolution affirmed that a proper fiscal policy requires that federal revenues and expenditures should substantially balance, and that since the war the Chamber has consistently worked toward restoring this country to a peace-time basis. "Yet," states the report, "we have a number of hang-overs from the war. Chief of these—and of perhaps most intimate relation to our domestic welfare—is federal taxation. In the face of repeated large treasury surpluses, and in a time when all other tax sources were given the benefit of substantial reductions, the corporation income tax was increased 1 per cent. Thus we are taking from that part of American business that is making profits, something more than an eighth of its profits every year for the support of the federal government, which in the last analysis comes from the millions of corporation stockholders and is in addition to their payments on their regular taxable income. No such ratio is justifiable under any circumstances except war. A reduction in the corporation income tax will strengthen the country against competition which is increasing from abroad and thereby permit the continuance of employment and prosperity in this country."

Britain to Have Aluminum Plant in Norway

Commenting on the situation of aluminum in Europe, R. S. McBride (*Mineral Industry*, Vol. 35) says: "The Glomfjord Haugvik Smelteverk A. S. is a projected aluminum plant of the Aluminium Corporation, Ltd. This concern has from the Norwegian government a water-power concession for fifty years, which will permit the immediate exploitation of a 50,000-hp. hydro-electric property with extensions subsequently estimated at 75,000 to 100,000 hp. as the maximum ultimate capacity. Aluminum production will begin on a moderate scale, but will expand at a relatively early date to 10,000 tons of primary aluminum per year.

The Iron Ore Resources of Brazil
AND THEIR
Economic Importance

By Emilio Teixeira
Mining Engineer, Passos Minas, Brazil

EMILIO TEIXEIRA

ALTHOUGH Brazil is known to have the largest reserves of iron ore in the world, little has been done in a practical way to develop for the nation this source of future income. Scant attention had been given by officials to the matter of the development of an iron and steel industry until recently, when the federal and state governments interested themselves in the solution of the problem. In this article I shall give a brief description of the ore reserves, the present condition of the industry, and its future development.

Where the Ore Is Found

Iron ore in Brazil was first noted about 1590 in the State of São Paulo in a mountain south of its capital. A few years later, the colonial government, much interested in the development of mining in the colony, brought trained men from Portugal to study the new discoveries. The first small furnaces were built in a place which later took the name of Ipanema. The large iron deposits in the central part of Minas Geraes were found about 1700, when the famous rush for gold took place in the country, around the town of Ouro Preto. However, no attempt to use this rich ore was made until the beginning of the nineteenth century.

The states known to have large and rich deposits of iron are Minas Geraes, São Paulo, Matto Grosso, Goyaz, Bahia, Santa Catharina, and Parana. The reserves located in Minas Geraes are the most important. There the deposits are exceedingly large and in some districts form real peaks and hills extending for several kilometers. Iron ore in Minas occurs principally in the Espinhaco range, the deposits being found along a line that stretches in a north and south direction for more than 200 km. This line also branches eastward to the headwaters of the Piracicaba and Doce rivers, and west to the Rio des Mortes. The principal districts in this region are Itabira, Ouro Preto, Mariana, Sabara, Itabira do Campo, Caethe and Conceiçao.

Hematite predominates in Minas, Bahia, Goyaz, and Matto Grosso; magnetite is found mostly in São Paulo, Parana, and Santa Catharina. Analyses of iron ores (Table I) from the many districts in Brazil have demonstrated the existence of an excellent grade of ore. In Minas they show a low percentage of phosphorus and an absence of titanium.

As to the geology, the main hematite area is composed of a complex crystalline schist, covered with a sedimentary bed. In central Minas Geraes the ore is found principally in two types.

Table I—Iron Content of Ores From a Few Districts in Brazil

		Per Cent
Hematite	Itabira	69.2
Magnetite	Sabara	72.0
Hematite	Gandarella	69.6
Canga	Gandarella	64.0
Hematite	Cacunda	69.8
Itabirite	Itabira do Campo	65.8
Hematite	Conceicao	68.0
Magnetite	Ipanema, São Paulo	67.0
Hematite	Morro do Ferro	58.6
Magnetite	Lencoes, Bahia	65.2

Ore of compact structure, found on the peaks and in massive hilly outcrops, and the rubble or disintegrated ore derived from the weathering of the massive ore, constitute the main classes. We also find a fine, sandy ore, a product of concentration in the valleys and streams; the canga, which is a hard conglomerate, found everywhere in the districts; and itabirite, a quartzite carrying iron in variable proportions and which can be concentrated with relative ease.

Ore Reserves

Unfortunately, the Brazilian iron deposits have not been studied thoroughly. They have been examined only superficially even in Minas Geraes. For this reason the tonnage figures for the country are far from correct. Gonzaga de Campos, the Brazilian geologist who died recently, made an estimate of 1,000,000,000 tons of rich ore for only nine deposits in the State of Minas. Clodimiro de Oliveira, professor at the School of Mines, estimates of 1,150,000,000 tons for Ouro Preto, Itabira, Santa Barbara, and Conceiçao alone. Henri Gorceix, the founder of the State School of Mines at Ouro Preto, declared in 1881 that he calculated 8,000,000,000 tons of ore for Minas Geraes. According to Olin R. Kuhn, in his article in the *Engineering and Mining Journal* of July 17, 1926, the total reserves for Brazil of iron ores ranging from 60 to 70 per cent Fe is 7,000,000,000 tons, half of which is credited to Minas. As may be noted, this includes only high-grade ore. If we are to add also the ores running from 50 to 60 per cent, the estimates

of total reserves can be doubled without fear of mistake.

Nature has been generous to Brazil, placing in its large territory an enormous quantity of rich iron ores, together with manganese, lime, and water power. All these essentials for a great industry are found in one section—the central part of the State of Minas Geraes, which is within 450 to 650 km. of the seacoast, on either the east or

Table II—Estimates of Iron Ore Tonnage in a Few Districts of Minas Geraes

		Tons
Cane	Itabira	132,000,000
Pitangy	Itabira	56,000,000
Santa Luzia	Itabira	32,000,000
Conceicao e Esmeril	Itabira	396,000,000
Itabira Peak	Itabira do Campo	32,000,000
Gaya e Lage	Sabara	536,000,000
Gandarella		80,000,000
Ouro Preto	(County)	303,000,000
Caraca Range		8,000,000,000
Curral Range	Bello Horizonte	1,250,000,000
Villa Nova	(County)	97,000,000

south. From this region undoubtedly will come a large part of the world's future supply of iron. Before the development of these great natural resources can proceed, however, two main problems must be solved. Certain essentials are lacking—namely, proper fuel and good, cheap transportation. No coal formations are found in this section of Minas Geraes. The only fuel so far used and produced locally is charcoal, which is becoming scarce and very expensive with the destruction of forests along the railroads and around the present steel plants. This supply in certain instances is uncertain and undependable. Extensive forests still exist, mainly along the Doce River, which may be considered to be a good reserve for that district, although they cannot serve an exceedingly large smelting center.

The southern coal fields in Santa Catharina and Rio Grande do Sul unfortunately cannot come to the rescue of the fuel situation in Minas Geraes, for two reasons: the coal is not suitable as yet for metallurgical purposes, and the freight rate from the colliery to the iron plants is high. The importation of foreign coal or coke is out of the question at present, not only because of its high price but also because of the expense of transporting it. Even with such a small production as that existing at present, the matter of fuel is already a serious problem. Those companies which own the few plants in the state have begun the planting of eucalyptus to insure a future supply of charcoal. The region has abundant water power, which is still undeveloped for economic reasons.

The fuel problem is, indeed, a complex one. If the country wants an iron and steel industry of large proportions, special consideration must be given to developing a supply of coal, charcoal, and electric power. Plans for the future should provide for an intensive study of the coal fields in the hope of finding suitable coal for metallurgical purposes; for regulating the exploitation of present forest reserves with the replanting of areas around the smelting plants to assure a constant and cheap supply of charcoal; and for a complete study of the water falls and rapids in the districts.

The other factor—transportation—although offering less difficulty and being only a question of capital, presents an important problem. The central part of the State of Minas Geraes, the main iron region, is from 450 to 650 km. from Rio de Janeiro. The Central of Brazil Railroad, on its way northward to Bello Horizonte, the capital of the state, and to Pirapora, crosses the western part of the district, with two branch lines running east. These branches are: one from Burnier to Ouro Preto, Mariana and Ponte Nova, and the other from Sabara to Santa Barbara. Another branch starts at the station of Murtinho and runs along the valley of the Paropeba River to Bello Horizonte. It is the continuation of the broad-gage (1 m. 60 cm.) from Rio de Janeiro. The branch line from Sabara to Santa Barbara will be extended to Itabira, the iron district which so far lies undeveloped, principally because of the lack of railroads. Itabira is awaiting also the construction of the Victoria e Minas Railroad, which, starting from the harbor of Victoria, in the State of Espirito Santo, at present ends at Antonio Dias, some 90 km. away. Thus it will be the terminal of two important railroads. This means that the ore or the finished product from the Itabira district will travel about the same distance to reach the seaports of Rio de Janeiro and Victoria.

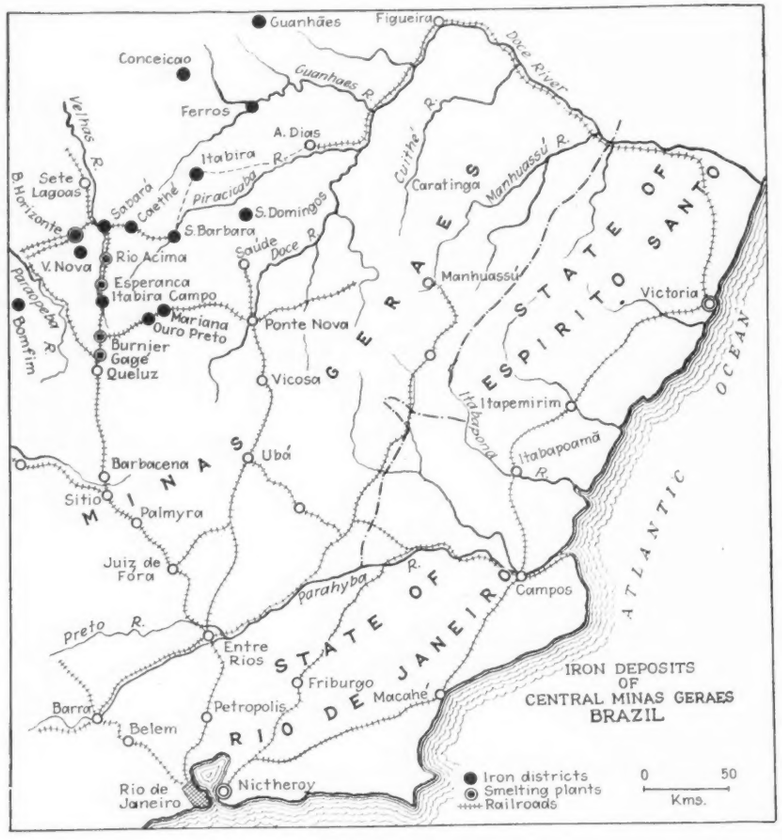
The Victoria e Minas road was projected with a view to the rapid development of mining, metallurgy, and agriculture in the Doce River region. Another ambitious aim of the company was the transportation of the ore to a seaport and then to a foreign smelting center, taking an easy way to the ocean along the Doce River. The railroad is of 1-meter gage. Its construction has been handicapped in many ways, so that it has advanced slowly. The expenditure of a great sum of money to put these roads in condition for intensive transportation of ore or other materials required by the smelters and other industries is out of the question at the moment or in the near future. The Central of Brazil, which ranks among the best in the country, is not in position to meet an increase in traffic without this large expenditure. It has enough trouble now in handling the manganese ore between the districts of Queluz and Burnier and Rio de Janeiro. Radical changes will be necessary if it is to

Map of Brazil showing the states having iron deposits and the approximate location of the latter

meet the requirements of a big industry. The Victoria e Minas road finds an ideal line descending from Itabira along the Doce River to a seaport, but even in its case many improvements are necessary before it can handle the heavy traffic which will result from the development of the industry in that district. Cheap freight rates and fairly good service are essentials.

At present seven blast furnaces are operating in Brazil, five in the State of Minas Geraes and two in São Paulo.

They are all of very small capacity. Some of them have had a hard struggle for existence. The principal furnace in Minas is, without question, the Usina Esperança, which operates also the Burnier blast furnace. It is one of the oldest plants in the state, and by reason of the skill of its present owners, it has set the industry an encouraging example. The company's two plants at Esperança and at Burnier are served by the Central of Brazil Railroad, and are a short distance apart. Their combined maximum capacity is only forty tons of pig iron daily.



Iron deposits of the central part of Minas Geraes, in their relation to seaports

Burnier is the terminal point of the broad-gage (1 m. 60 cm.) line, also the starting point of the narrow-gage northward and of the Ouro Preto branch line (1 m.). It is a busy and active place, lying strategically in the manganese and iron district. The furnace is close to the station. The plant consists of a fifteen-ton furnace, a foundry, and machine shops. Here the ore is mined from a surface deposit, screened and transported by a short, narrow-gage electric road either to the tipple of the furnace or to the ore bins for transportation to the Esperança plant. The mine is a short distance away. The plant was built by the Wigg's interests and has been remodeled by the present company.

Esperança is near the town of Itabira do Campo, or Itabirito, in the shadow of Itabira Peak. It is a larger and more modern plant than that of Burnier. Built in a narrow valley on the west side of the railroad, with the peak in the background, it presents an attractive view. The ore comes from the bins at Burnier, where it is easily loaded into the railroad cars. At Esperança it is unloaded and then taken to the furnaces by a narrow-gage electric road, which also provides all transportation needed at the plant.

Two blast furnaces provide a total capacity of twenty-five tons daily. A fine machine shop, a modern foundry, and a converter for steel make part of the installation. Electric power and light are used throughout the plant. Charcoal is the fuel used at this and the Burnier plants. To provide it is already a serious problem, perhaps the only one that worries the management. To safeguard the future, the company is planting eucalyptus. The same policy is being followed by many companies because of the difficulty already experienced in obtaining the fuel at a reasonable price and when wanted. The St. John del Rey Gold Mining Co., at Morro Velho, has also an extensive plantation of eucalyptus. Manganese is obtained in the Burnier district and limestone is found locally.

The company's property is large and has extensive iron reserves. Itabira Peak, with its rich ore, belongs to it. In charge of the plants is Dr. Mario Rache, an engineer of wide experience. Especially is it due to his persistency and ability in the reorganization and running of the Esperança and Burnier plants that both have had a rather prosperous life and are leaders in the Brazilian industry. Strategically located in this rich district, the company certainly should have a bright future. The impression given by a visit to the Esperança plant is that of an active and busy place, of a real smelting center, although as yet one of small proportions. The pig iron produced is of excellent, uniform grade and is in good demand.

Next in importance comes the plant of the Cia. Siderurgica Belgo-Mineira, situated at Sabara, a few kilometers from the capital of the state. This also is served by the meter-gage road of the Central of Brazil. The company was organized not long ago and operates a twenty-ton blast furnace, a converter, a cement factory using the slag, and a large brick factory. The plant is erected in spacious ground in the outskirts of Sabara, on the branch line to Santa Barbara. Although of small capacity, the installations are modern and are well equipped. The hematite ore comes from the Segreado mine, a few kilometers away. Transportation has been a serious problem, as the mine is not on the railroad. Improvements are being made to eliminate this difficulty. The company owns other mines at Rio das Velhas, Monlevade, and Andrade, and is awaiting the construction of the railroad before attempting to exploit them. A larger production is planned.

Among the other plants in the state, all of small capacity, are the following: Rio Acima, situated at the station of Rio Acima, near Esperança, with ten tons' daily capacity; Magnavacca, at Bello Horizonte, the capital of the state, with a production of ten tons daily. At Gage, near Queluz, 473 km. from Rio de Janeiro, on the broad-gage division of the Central of Brazil, the Cia. Nacional de Fornos Altos is building a fifty-ton plant. It is said that the last-mentioned enterprise will be the

most up to date in the state. Several companies have been organized for the purpose of establishing new smelting plants, but so far they have not even started building. They are probably awaiting better conditions.

At Ipanema, in Sao Paulo

The State of São Paulo was the first to have an iron-smelting furnace. This was near the end of the sixteenth century, and the type of furnace was most primitive. The little producing center was situated not far from Sorocaba, probably where stands today the old Ipanema plant. Not until the nineteenth century was reached were the processes improved. According to the description of the industry at that time, the first improved furnace was built in 1818, and was operated until 1860. Remodeled in 1865, it continued producing iron irregularly until 1896. Only a few years ago did the War Department decide to build at Ipanema a twenty-ton blast furnace. The ore is magnetite, containing titanium and high phosphorus. Limestone is found locally. Charcoal is expensive and the production is unreliable. The plant has been in the hands of the federal government since the days of the Empire. The city of Sorocaba, near Ipanema, is an active manufacturing center. The Sorocabana railroad serves the plant.

No other attempt has been made to utilize the reserves at Ipanema, although they are situated so near the city of São Paulo, with its 800,000 population. The characteristics of the ore and the difficulty in obtaining proper and abundant fuel must have been the reason for this phenomenon.

Electric Smelting at Ribeirao Preto, in Sao Paulo

The Cia. Electro-Metallurgica Brazileira was organized at Ribeirao Preto, in São Paulo, about 1917. It is the newest plant in Brazil and the first one to use electrical power in smelting iron ores. Dr. Flavio Uchoa, who is at the head of the organization, is running this up-to-date plant, built in the outskirts of Ribeirao Preto. It consists of two 25-ton electric blast furnaces of Swedish type, two 6-ton Bessemer converters, one 6-ton electric furnace for refining, 1 laminating machine for ingots, 1 laminating machine for commercial types, and machine and foundry shops.

The ore is hematite and comes from the company's mine at Morro do Ferro (Iron Hill) in Passos and Jacuhy counties, in the State of Minas Geraes. It is mined from surface deposits and is washed to remove adherent clay. The ore is transported to the Mogyana Railroad, on a 14-km. branch line owned by the company. From this point it travels to Paraizo, where it is transferred to the São Paulo e Minas Railroad, of 60-cm. gage, and taken to Bento Quirino, also on the Mogyana road. Here the ore undergoes another transfer to Mogyana cars and is taken directly to the smelter. The São Paulo e Minas road is now a property of the company. This acquisition was made to shorten the distance from mine to smelter, which was about 400 km., following the Mogyana through Casa Branca. The company is building a 1 m. 60-cm. gage branch line from Serrinha to Ribeirao Preto and has finished the addition of a third rail on the meter-gage line from Paraizo to Morro do Ferro. By this scheme, the ore can be loaded at the mine into the company's ore cars and taken directly to the plant. The distance will be reduced to about 170 km. and the freight expense considerably lowered.

It seems curious to take ore from the mine, where abundant water power is available, and transport it a long distance to a reducing plant far away from its sources of supplies. The explanation of this is that the Companhia Electro-Metallurgica was organized at Ribeirao Preto with local capital, having the Companhia de Electricidade (Electric Company) as the largest stockholder. It happened that this company had a large excess of power at that time, and, to utilize this excess, the organizers thought it better to erect the smelting plant there, bringing the ore and limestone from Morro do Ferro.

Plant Well Built

The plant, which is attractive in appearance, is not far from the city of Ribeirao Preto. It has substantial, well-constructed buildings and spacious yards, with plenty of ground for future extensions. The plant is served by a branch of the Mogyana Railroad. It is most modern in its equipment. The steel furnace has been operating since 1922 on scrap iron. The Bessemer converters have worked only at times. One of the electric blast furnaces was started in 1923. The results have been encouraging, excellent pig iron and steel of good grade being produced. Contrary to the company's expectations and plans, the excess energy from the city's power plants was not sufficient for running the entire works, which made it necessary to have another source of electric power. The construction of an additional power plant at Rio Pardo was then decided upon and is now almost completed. Once this is finished, the two furnaces will be started up and the plant will be run at full blast.

At first the operations were conducted by foreign engineers, having Brazilian engineers as assistants. For the last two or three years, however, the works have been in charge of the latter. According to Dr. Uchoa, the native labor has picked up quickly the knowledge required at the plant, and everything is going well. The data published some time ago about the operations there show that good results are being obtained, especially with the electric blast furnaces. As compared with results in Sweden and Norway, the operators are getting lower figures for consumption of electric power, but higher ones for charcoal. The steel now produced at the plant is of good quality and is sold readily in the local market. The charcoal is obtained with some difficulty and at high prices from the neighboring country.

The Question of Reserves

One question arises: Has the Companhia Electro-Metallurgica a sufficiently large reserve of rich ore to insure the continuous running of its modern and expensive plant at Ribeirao Preto for a good many years? Some exploratory work has been done in Morro do Ferro mine, but nothing has been made public regarding the amount of ore in sight or the probable reserves. So far, the ore mined is derived from surface gravel, which does not go very deep and is found only in certain areas. It is surprising that the region has not shown another mine. This, perhaps, is because of the lack of extensive and intensive prospecting. Outcrops of itabirite are found in many places. The country is hilly, with many streams. The mine is on the right bank of the Sant' Anna river. What is known to be an unusually large deposit of rich garnierite has been prospected in this region at Morro Pelado. Limestone of excellent quality is quarried locally for lime burning and for the smelting plant at Ribeirao Preto.

Ribeirao Preto is the center of the greatest coffee plantations in the world, and is beautifully situated and

laid out, with fine buildings, paved streets, and luxuriant gardens. It is the fourth city in the State of São Paulo and one of the busiest and most progressive. The works of the Companhia Electro-Metallurgica will undoubtedly contribute a great deal to the future of the place, adding another impulse and stimulus to a greater development. The strategical situation of Ribeirao Preto, commercially speaking, with its many railroad facilities, will give the company easy markets for its products.

Brazilian metallurgists are looking with keen interest to the development of the Companhia Electro-Metallurgica. The enterprise is new to the country, and for this reason has attracted the attention of capitalists, and of mining and metallurgical engineers, especially those interested more particularly in the simultaneous development of the iron and water-power resources. The operation of the plant in its first few years will afford experience from which increased interest and confidence in the new industry will undoubtedly grow. Once the success of the venture is proved, identical enterprises will appear in other parts of Brazil, especially in Minas Geraes, where all the conditions are much more favorable than at Ribeirao Preto. Axel Hartman, engineer and metallurgist, of Sweden, writes that there are large prospects for this new industry in the country. He considers Brazil as the country having the greatest possibilities in this respect.

Investments in mining are not regarded with favor in Brazil. Little encouragement by the governments, insufficient data as to our underground wealth, limited knowledge of the nature of the mining business, and lack of confidence in the results, account for the mining depression which has existed in the country for many years. As far as electro-metallurgy is concerned, the plant at Ribeirao Preto should be an illuminating example to local business men. Whatever the results may be, the operation of this plant will have a prominent place in the annals of electro-metallurgy in Brazil.

The Nation's Problem

The problem of the iron and steel industry is today a nation-wide question. The federal and state governments have under consideration various projects designed to help the situation. In Minas, the state government is much interested and is desirous of reaching a practical solution as rapidly as possible, for the problem is related closely to the development of the state. With respect to the entire country the solution of the problem also means a great deal, inasmuch as it is the key to a greater progress of all other industries that depend on iron and steel. The nation will not have a fair chance to progress until its metal problem is solved and cheap machinery and rails can come to the aid of agriculture, factories, and railroads.

Besides the fuel and transportation problems which I have already mentioned, another question has arisen—what policy is to be followed in organizing the iron and steel industries? Many different views find expression, which in itself has been another cause of the delay in reaching a solution of the problem. Many specialists think that the best plan would be to allow the exportation of a certain amount of ore and to have the producing companies erect plants of medium size in the districts. These plants would use foreign fuel brought as a return boat cargo.

Another current of opinion takes the other side—namely, that the ore should not be exported, but should be smelted in Brazil, using electric power, charcoal, or possibly Brazilian coke. The government policy leans somewhat toward this group, perhaps in a protective way. This plan involves certain important factors, the consideration of which will require work and time. Among them are the lack of Brazilian coke and the cost of electrical energy: the first is yet to be found and the second is merely a question of installing the power plants cheaply so as to produce the unit at a reasonable price. So far, the coal fields of Santa Catharina and Rio Grande do Sul have not produced a coal with fair coking qualities. The question as to how cheaply fuel can be brought to Brazil is a matter of importance. The Victoria e Minas Railroad was organized mainly to develop the Doce River and Itabira regions, especially the latter, where the iron deposits are large and rich. The Itabira Iron Co. seems to be composed mostly of stockholders of the above-named railroad and has rich properties in the region.

A Seaport Necessary

This plan calls for a suitable seaport to take care of the ore that is to be exported and the fuel received from foreign sources. This port should be either at Victoria, a safe harbor, or somewhere at the mouth of the Doce River. If situated in the latter place, this specially built harbor would be ideally placed, as the distance from the iron districts to the sea would be shortened and the transportation of ore would be much easier along the Doce River. Many improvements must be made on the Victoria e Minas Railroad to meet the requirements of this plan. The smelting plants or the smelting center could be built about halfway between the mines and the sea. Such a location would afford many advantages, according to some.

The consequence of all these plans is that, while the politicians discuss the bases on which the industry should be laid, the nation awaits patiently the solution of its most vital problem. In the meantime the railroads, forge shops, and other important industries will continue to take foreign iron and steel at a dictated price.

The erection of huge smelting plants for a large initial output should not be encouraged. The statistics for 1923 show the need of the country to be around 300,000 tons of iron and steel of all grades and shapes. With the approach to normal times—that is, pre-war conditions—this figure may go up to 500,000 tons, as in 1913. An increase in production slightly over this limit would certainly be sufficient to meet the present needs and leave a surplus for exportation to previously studied markets in South America. This excess, produced at low prices, could compete with the foreign product in Argentina, Uruguay, Paraguay, and Bolivia.

There are many rich districts in Brazil, particularly in Minas Geraes, and they should be worked with attention paid to the individual characteristics of each. No generalized plan applicable to all is feasible, as the conditions in the numerous districts vary too widely.

What the people of Brazil want is that the iron ore should be smelted and converted into iron and steel, which is needed everywhere. To them it does not matter if the government allows the exportation of the ore or keeps it in the national territory. The local feeling is that the immense reserves should not continue buried any longer, now that the country is so much in need of the finished metal.

The government should ignore politics in considering this serious problem. Instead, let it open the way to natural development, giving the necessary aid and stimu-

lating capital to enter the new industry. Confidence is what is desired most, and this must be instilled by the government. The country cannot refuse to permit the exportation of part of its reserves, for this will encourage mining and will open the way to further development, especially if fuel is brought back as a return cargo. The reserves are enormous and the exportation of a restricted amount yearly will not be harmful. Great efforts should be made to establish smelting plants in the various districts. When an industry is once established, the nation will progress and will have solved its most vital problem.

Reference—Bull. No. 2. "Informacoes sobre a Industria Siderurgica." Gorzaga Campos.

Tantalum and Niobium

TANTALUM and niobium, or columbium, as the last-named metal is sometimes called, are nowhere found in the native state nor in sulphide or other similar minerals, says W. W. Saw in a paper read before the Chemical Society of Western Australia. They exist always in combination with oxygen or one or more other metals, the oxides having an acid character and giving rise to tantalates and niobates. They invariably occur in conjunction, replacing one another isomorphously to a variable extent, the niobate often passing by insensible gradation into the tantalate without change of form or physical character other than a corresponding rise in specific gravity, tantalum having an atomic weight about double that of niobium 931.1 Nb, 181.5 Ta.

The most usual primary occurrence is in pegmatite veins in granite, especially those characterized by the presence of much albite. The minerals which contain tantalum and niobium include tantalate, manganotantalite, columbite, manganocolumbite, tanteuxenite, stibiotantalite, fergusonite, microlite, manganomossite, ixiolite, tapiolite, tantalo-polycrase, and ilmenorutile. About forty minerals containing Ta and Nb have been recognized.

Tantalum, continues the paper, is a metal of a steel-blue color when unpolished and nearly a platinum white color when polished, the polishing probably removing the thin film of oxide which is on the unpolished metal. It is very ductile and tough. The melting point is about 2,900 deg. C. The specific gravity is 16.6 on the worked metal. Niobium is softer, lighter (specific gravity 8.4), and more easily fusible (melting point about 1,900 deg. C.) than tantalum and less ductile. Neither metals is attacked by acids except hydrofluoric, nor by caustic alkali solutions, but fused nitrates and alkalies act upon them.

Niobium has no commercial use, either for the metal or its salts. Tantalum has been used for filaments of electric lamps, but tungsten has replaced it, as tungsten is more efficient from the standpoint of electric consumption and lighting quality. It has no advantages over tungsten in high-speed steel and tungsten is much cheaper. An alloy of iron and tantalum was the first rustless steel.

Production of pure tantalum in large sheets was accomplished in 1921. Since then its use has been developing in the manufacture of dental instruments and spatulas, surgical tools, pen points, filament wire for incandescent lamps of thermionic tubes, plates and support wires for thermionic tubes, hypodermic needles, cathodes for use in chemical analysis, analytical weights, laboratory dishes, spatulas, stirrers, and other devices in which a perfectly acid-proof metal would be more suitable than porcelain or glass, acid-proof pumps, in battery chargers, electrolysis apparatus, radio, and similar uses.

What Is Engineering?

The Mining and Metallurgical Society of America has conducted an inquiry among its members with the hope of formulating a definition of the word "Engineering" that will stand against criticism. The following excerpts are from a "progress report" published in the current issue of the "Bulletin" of the society:

WIDE INTEREST in the definition of "Engineering" has been shown by the number, length, and character of the replies received to the letter sent to all members by authority of the executive committee. There is a growing appreciation of the necessity for an "engineering" as well as legal definition of "Engineering," and the society is hopeful of accomplishing this task. However, it is a very difficult one and subject to many shades of consideration and criticism.

Some members think the definition too broad; others think it not broad enough. Some think the attempt to define "Engineering" is futile; one thinks there is no general interest in the subject, which is in opposition to the very large number of comments and suggestions made. The definition suggested by the original committee, composed of F. L. Sizer, chairman; Corey C. Brayton, S. S. Fowler, and Robert A. Kinzie, was:

Engineering is the practical application of scientific methods to the utilization of the resources of nature for the use of man.

This definition, and an amended form, as follows, were sent out for comment:

Engineering is the application of scientific methods to the utilization of the resources of nature.

The committee is prepared to defend its original definition, which is approved also by Erle V. Daveler, H. I. Young, Robert Linton, Dr. F. C. Schrader, James MacNaughton, and Prof. Robert H. Richards.

Stanly A. Easton, H. C. Bellinger, Frederick Burbidge, Pope Yeatman, A. P. Rogers, N. H. Darton, Cleveland Dodge, Prof. Robert Peele, R. C. Canby, C. V. Drew, George C. Stone, J. Cuthbert Welch, Ernest Howe, E. H. Lawall, Prof. Collier Cobb, H. A. Buehler, Arthur Thacher, W. H. Bassett, Prof. W. Lindgren, A. F. Keene, Howard N. Eavenson, R. C. Allen, William Young Westervelt, W. Sprott Boyd, Walter Hovey Hill, William T. MacDonald, Henry Mace Payne, Walter Douglas, Prof. Joseph T. Singewald, John Carter Harrison, R. M. Catlin and John T. Fuller approved the amended definition.

Percy E. Barbour offers the following:

"I have been a member of the New York State Board of Licensing for Professional Engineers and Land Surveyors for seven years, and have seen the board continuously handicapped by the lack of a proper definition of 'Engineering.' The board has never attempted one and up to the present the ideas of its several members have not been in accord. Until now I had never had the temerity to try to formulate such a definition. But the benefit of the study of the pros and cons of the subject sent in by our members plus the increasing need for such a definition that I have felt during the last seven years has stimulated me to make an effort which I submit not with the idea so much of being original as with the sole desire to be helpful in crystallizing the thought that has been put upon the subject by so many:

"'Engineering is the judicious application of the technical sciences to the solution of inanimate mechanical problems.'

"The word judicious implies thought and experience and, based on both, judgment. Without judgment one cannot be an engineer. A new tecnical graduate, or a neophyte or dilettante may know more or less theories but his use and application of them will not be engineering unless he applies them properly or judiciously.

"The word application, which may be either mental or physical, implies use, and differentiates the engineer from the pure scientist or the theorist, who, having produced a theory however valuable, leaves it to the engineers to be used.

"Technical is defined by lexicographers of recognized authority as 'pertaining to the mechanical arts,' hence the use of the words 'technical sciences' differentiates the engineer's art from that of the physiologist or biologist, both of which are highly scientific.

"'Engineering' as generally employed, which we are trying to reduce to words, is not the application of the sciences or knowledge to the resources or forces of nature but the application of such erudition to accomplishing something by humans, even though it may not be humane. Each such accomplishment is the solution of the individual's problem, hence the use of the words 'human solution.' Natural bridges in Utah and Virginia and certain pinnacles in our national parks stand up because by a freak of nature they are in forms in accordance with developed scientific principles, but to call nature an engineer would stretch the definition into the realms of phantasy. Likewise the bee, ant, and beaver are not engineers, although their works may exhibit accepted engineering standards.

Misuse of Term "Engineering"

"We speak loosely of 'engineering a deal' or 'scientific methods of bookkeeping,' etc., each of which is a human problem; hence to limit such solving of problems to engineering they must be 'mechanical,' the lexicographer's definition of which is 'pertaining to the principles or laws of mechanics,' which latter is defined as 'The mathematical doctrine of the motions and tendencies to motion of particles and systems under the influence of forces and constraints; in a narrower sense, this doctrine as applied to rigid bodies.' This may seem a long way around, which is the fault of our language, but after all it brings us to the fundamental basis of an engineer's work.

"Pseudo-engineering of human problems, 'engineering of men,' etc., is not engineering at all; it is psychology. When the engineer, as he must at times, leaves inanimate problems he is not doing engineering, however vital this may be to the economic success of his engineering problems. Hence the word inanimate in the definition.

"No educational qualification can properly be included except so far as it is covered by the word judicious. Education is a relative term, and may be acquired (more or less) within the classic walls of a proud educational institution or in the school of hard knocks. It is not necessary to cite the name of men who prove that the letters after a man's name or the lack of them do not necessarily indicate his erudition.

"The term economic makes the definition vulnerable because a toll bridge, which might exemplify the best of engineering, might be a complete failure as a revenue producer and hence uneconomic. An elaborate and extensive Turkish bath might be built in the polar regions that would exemplify the very best engineering as to structural, heating, lighting, and power details, but it probably would be an economic failure. The fault, however, would be chargeable against the promoter and not the engineer.

"'Judicious' also seems to cover all that the word 'practical' would, but without the many objections to the latter. Moreover I doubt that the word 'practical' really expresses what its advocates have in mind.

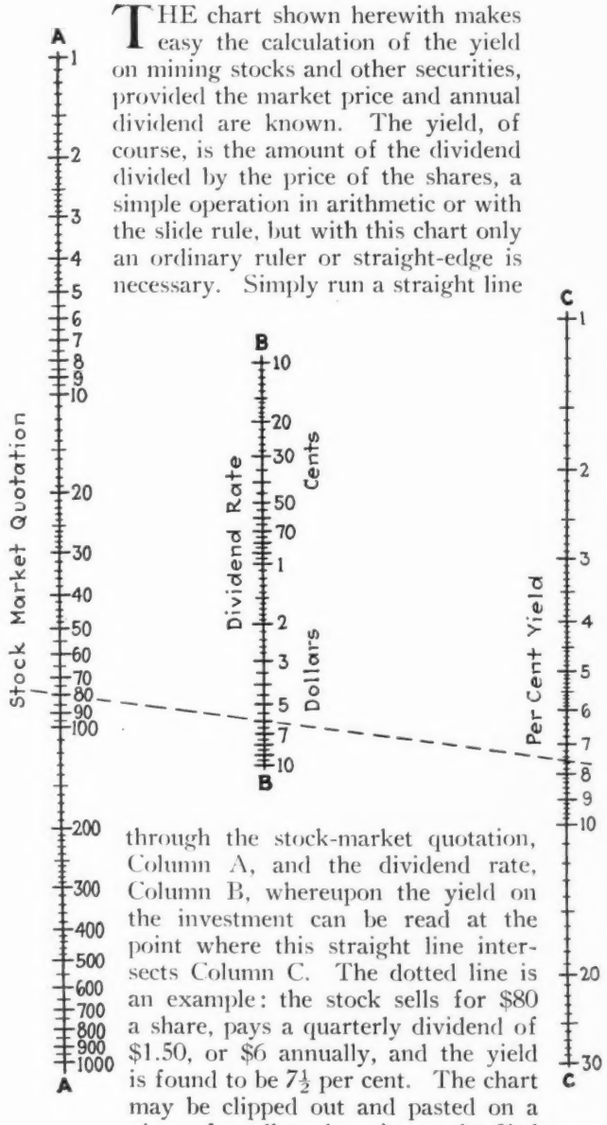
"Let us see how this definition stands up under the examples, cited previously, of those who would be included in a definition that was too broad.

"A locomotive fireman would not be included because he is not thinking out a solution of a problem. He is stoking a furnace. A milking-machine operator or a mine mucker shoveling scientifically could not be included because he is not applying science to the solution of a problem, but is using the results and methods of a scientific solution evolved by engineers. So, too, logging, obstetrics, poultry raising, etc., which the resources of nature suggested to some, are impossible of inclusion."

What Is the Yield on Stocks?

By W. F. Schaphorst

THE chart shown herewith makes easy the calculation of the yield on mining stocks and other securities, provided the market price and annual dividend are known. The yield, of course, is the amount of the dividend divided by the price of the shares, a simple operation in arithmetic or with the slide rule, but with this chart only an ordinary ruler or straight-edge is necessary. Simply run a straight line



through the stock-market quotation, Column A, and the dividend rate, Column B, whereupon the yield on the investment can be read at the point where this straight line intersects Column C. The dotted line is an example: the stock sells for $80 a share, pays a quarterly dividend of $1.50, or $6 annually, and the yield is found to be 7½ per cent. The chart may be clipped out and pasted on a piece of cardboard, or it may be filed in a standard No. 105 loose-leaf notebook.

DISCUSSION

Prospecting in the Moonshine Country

THE EDITOR:

Sir—Some friends of mine, one a geologist and the other a mining engineer, and both prominent in the Lake Superior country, are engaged just now in a somewhat unique prospecting enterprise, one that may not be without its thrills. It is in one of the Southern states, where moonshining is a recognized industry, and in a portion of that state where it is the predominant business and where stills are more permanent than usually. My friends, by the way, are looking for mineral.

The region is one of small farms scattered throughout a rough and broken country. These pitifully squalid and sterile farmsteads are set in little tillable spots in the primeval forests of the region; they are reached only by trails through the woods, and almost every trail is supposed to lead to a still. The farms grow corn, a few hogs, some miserable cattle, and numerous hill billy mountaineers. Their corn cannot be shipped in the raw state; for many, many years, and since long before the prohibition amendment, it has been made into white whisky; the razorback hogs are a byproduct.

There has been no great difference for a generation or more in the suspicion with which these mountaineers view strangers or in the watchful care they exercise in guarding their affairs. The passage of the Eighteenth Amendment meant nothing to them. Before it they were under the ban of excise officers; since then they are viewed with doubt by federal dry forces. Not that these federal men bother them much; by common consent they are left rather severely alone. Sudden death and no funeral is likely to the portion of anyone caught spying about these hills. It is a custom of long standing to shoot first and investigate afterward. General opinion is that nothing short of an armed force of considerable strength would be effective in bringing this region under the law.

My two friends are aware of all of this; they are taking the precaution of having with them a guide who can vouch absolutely for their mission and who is a native of the region and knows practically every man in it. In no other way would the lives of these two engineers be worth very much. They will be traveling the trails and examining the country. In the native mind there would be but one reason for this. The habit of shooting first and asking about it afterward still is strong thereabouts, and no wise stranger dares to go perambulating along these blind and hidden trails.

It seems that there is an organized system of defense. Approaches to stills always are guarded, usually by two or three men with rifles who are stationed at vantage points in the hills where every trail is in line of observation and where every watcher can communicate by signal with his fellows and with the stills in his neighborhood. Every inhabitant, every cabin dweller, is a spy on the outsider, however well he may be vouched for, and every suspicious word or act is known throughout the district almost at once. Many murders have been committed; more probably will be; and that there are not more now is due simply to the fact that outsiders are familiar with the situation and do not often blunder into the region or enter it at all unless definitely and absolutely sponsored by some trusty.

W. E. DWIGHT.

New York.

* * * *

Old Faithful—the Hydraulic Compressor

THE EDITOR:

Sir—In 1907 *Engineering and Mining Journal*[1] and other periodicals devoted to mining published discussions of the Taylor air compressor installed at the Victoria copper mine, in upper Michigan. This was a hydraulic compressor, a development of the trompe known in the ancient history of mining. This compressor was situated on the banks of the Ontonagon River, from which its water supply was obtained. The water, taken from the river by means of a dam and canal, was allowed to fall through a 330-ft. vertical shaft, entraining air as it entered the top of the shaft. At the bottom the water and air were discharged into an underground chamber, 282 ft. long, in which a separation of the two took place, the air being compressed between the surface of the water and the roof of the chamber. In the roof, at the far end, was an outlet for the air through which it entered an air main, set in an inclined shaft, and flowed to surface compressed to a pressure of 117 lb. per square inch. Up through this incline also ran a blow-off main which functioned as a governor. The capacity of this "compressor" was about 10,000 cu.ft. of free air per minute. The air was used to drive the machinery of the mine and mill.

In the discussion of the plant when it was new, the question was raised as to the length of time that must elapse before it would need to be shut down for cleaning silt out of the chamber. I do not know whether that time was ever reached, but I think not, for the water is clear enough today for trout. The mine has been abandoned for seven or eight years, but when I passed that way about five weeks ago (late in August, 1927) the compressor was still operating and the relief valve, used to keep the water level in the chamber constant, was blowing off regularly, giving a play of water that might easily be mistaken for a geyser.

Most abandoned mines are quickly stripped of all portable machinery, but here is something not portable. There are no brass fittings. It comes as near to being an example of perpetual operation of fool-proof machinery as one is likely to see. I see no reason why it should not continue to operate until the canal fills up. It is still faithful to the best traditions, for the air main leaks.

Lawrence, Kans. C. M. YOUNG.

[1] *E. & M. J.*, Jan. 19, 1907. "The Hydraulic Compressed Air Power Plant at the Victoria Mine," by D. E. Woodbridge.

A Warning From the Dominion Survey

THE EDITOR:

Sir—During the last two months several persons in western Canada and western United States have been swindled by a man who claims that he is Allan P. Dowling. His procedure has been to call upon some one well acquainted with the Geological Survey of Canada and represent himself as being on Survey business and temporarily short of money. He has usually asked for a loan of anywhere from $75 to $200, for which he tendered a draft on the Survey at Ottawa, or some other paper security that has proved to be worthless. He then has moved quickly to another place and repeated the trick. So far, he has moved too quickly to be located and apprehended. His operations appear to have begun in southern Alberta, extended to British Columbia, and thence into the United States, where he was last known to be in Los Angeles.

This scheme has worked, because Dowling's father, who died a few years ago, was a widely known and respected officer of the Geological Survey, and the son also was connected with the Survey in a clerical capacity for some years; but this connection was ended in 1926. He has no credit and no valid credentials from this department. Although the Geological Survey is not in any way legally responsible, I am impelled, because of the illegitimate use he is making of a former connection, and by a desire to protect other persons who may be vulnerable because of their friendly attitude to the Geological Survey, to ask your assistance in publishing a warning. We have on file in this department several letters from reputable persons to bear out the statements I have made.

Dowling is thirty-seven years old, about 6 ft. tall, and heavily built, probably weighing between 200 and 225 lb. His hair is light brown, his eyes pale in color, his teeth ill-kept, and his enunciation somewhat indistinct.

Ottawa, Canada. W. H. COLLINS,
Director Geological Survey of Canada.

* * * *

Domestic and Russian Manganese

THE EDITOR:

Sir—A few weeks after we entered the World War it was a well-known fact that manganese was one of the principal war metals, and the increase in price greatly stimulated production of domestic ore. Money poured into the domestic industry, and considerable progress was made in the exploration of deposits. Immediately after the armistice the bottom dropped out of the market for the ore, resulting in the suspension of practically all operations. After a considerable fight the present tariff went into effect in 1922, and operations began again. As soon as they were well under way the no-tariff interests started their agitation to have the tariff reduced or removed.

In this case the opposition to the tariff does not come from the consumers of steel but from certain financial American interests with concessions in Russia. These "patriots" prefer to make investments in foreign territory and then try to strangle our domestic industry. To sift the matter down, this fight is between a number of domestic operators on one hand and a very few capitalists operating in Russia. MARSHALL HANEY.

Geer, Va.

By the Way

Sinking Shafts in Ore

ONE of the most common misconceptions by laymen is that if one sinks a mine shaft the ore should be approached by the most direct route, and that if the shaft passes through ore all the way down so much the better; perhaps enough ore could be taken out of the shaft as it was sunk so that it would not cost anything! The *Wall Street Journal,* for example, prints a Toronto dispatch to the effect that a certain mine shaft "which was carried down from 1,100 ft. to open up the massive high-grade material indicated below 2,000 ft., should be into the spectacular orebody any day now, if it is not already there." As a matter of fact, the orebody at the mine in question dips at an angle of approximately 65 deg. and the shaft is vertical. Instead of the shaft penetrating the orebody, it will be 2,000 ft. or more away from it at the lower crosscuts. In minor operations, of course, sinking sometimes follows the ore, but where permanent operations are planned, it is desirable, among other considerations, that the shaft walls be of some material that is not wanted so badly at the surface as is good ore.

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The Capriciousness of Pronunciation

MOST of our friends have eccentricities of pronunciation to which we become accustomed, but when we hear, as we so often do, strange and seemingly incorrect pronunciations of certain words through the loud speaker we wonder why correct speech is not one of the fundamental requirements in the selection of radio announcers. The British Broadcasting Co., it seems, with the advice of G. B. Shaw and other authorities, has issued a list of words commonly manhandled by these very public speakers, with a ruling as to the preferred form of utterance. Our old friend "research," it is suggested, should be pronounced with the accent on the second syllable, a high ideal that is rarely reached, at least in the United States. In fact, the staff of The Research Corporation themselves (the company that controls the Cottrell patents) usually accent the word on the first syllable, if we are not mistaken. Popular treatment of the word "assay" is similar. Once upon a time a new man was hired for an assay office who said, correctly enough according to the dictionary, that he was an "as-say'-er" and he was prepared to do some as-says'. He was considered more or less a joke, so that perhaps his real ability was largely discounted and he did not last long. The British Broadcasting Co. rules further that "iron" should be pronounced with the "r" silent—presumably therefore like "ion." It is to be hoped that no erudite British chemist will be called upon to speak on the subject of "The Ions of Iron." Wandering from the technical field, other words might be mentioned whose common pronunciation does not jibe with that of the dictionary: the self-appointed authority already cited says that "adult" should be pronounced with the accent on the first syllable, which is the way it is usually heard in the United States at least, but unknown to Webster. The word "address" is similar, also "abdomen"; not one in a hundred accents the second syllable. Perhaps a new rule is in process of formation: "In words beginning with "a," accent the first syllable!"

NEWS OF THE WEEK

Summary

ANALYSIS made of final estimates filed with the Budget Bureau for the fiscal year 1928 shows that department budget officers of the Department of Commerce acted generously toward the Bureau of Mines.

* * * *

August gold production in the Transvaal constitutes another record for the industry; output for the month totals 863,345 oz., having a value of £3,667,256.

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Calumet & Arizona develops on 1,900 level of the Campbell shaft, near Bisbee, Ariz., a continuation of the large orebody recently discovered in the shaft.

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Section 16 mine of the Oliver Iron Mining Company, at Ishpeming, Mich., operates continuously for seven years without a fatal accident.

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Operators, ceasing to look for higher silver prices, markedly reduce working costs in Guanajuato mining camp of Mexico.

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Recent tests made by the U. S. Bureau of Mines indicate that radio waves will penetrate 600 ft. or more of rock strata.

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Better results being obtained from the Barry-Hollinger mine stimulate activity in the Boston Creek district of Ontario.

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Early passage of the Precious Stones Bill by the parliament of the Union of South Africa is expected.

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Inability of interests to reach agreement in plan to stabilize price of tin is reported from London.

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Dredges working on Nome Creek, in the Chatanika district, Alaska, report good returns.

"Air Blast" in Quincy Mine Buries Seven Men

Members of Timber Crew Repairing Shaft at 41 Level—Two Bodies Recovered—Others Still Covered by Large Mass of Broken Rock

SEVEN MEN, members of a timber crew, were killed in the Quincy copper mine at Hancock, Mich., Oct. 29, by a fall of ground following an air, or pressure, blast in No. 2 shaft. The victims were George Williams, Henry Hirsikoski, Arvid Nosko, John Israelson, Ernest Schilling, Emil Aittima, and John Konoski. All were married and leave families. Two of the bodies, those of Israelson and Aittima, were found the following morning under 12 ft. of rock. On Nov. 1, the remaining five bodies were still buried deeply, and it was feared it would be a matter of many hours before the rock could be removed.

The men were at work at the 41 level, 4,100 ft. from surface, retimbering the shaft, which was damaged by fire which broke out July 13 and burned upward for a week or ten days. Since that time the shaft has been out of commission. The blast came with such suddenness, followed almost instantly by the fall of rock, that the men were unable to help themselves. They were buried under tons of rock which fell into an old, burned-out loading chute, which the men were engaged in blocking up, and into the shaft. The rock was wedged in tightly in the chute and shaft and the task of removal was difficult. Rescue crews, working in relays, found it necessary to retimber as they progressed. A small hoist was set up to lift the rock from the 41 level to the 40, where it was dumped into the mine skip and hoisted to surface. Anxious relatives and friends of the victims gathered at the shaft immediately it became known that the men were missing. Powerless to aid, they kept constant vigil, but with little or no hope. Four other men of the timber crew were on the 40 level, lowering a timber to the seven on the 41 level, when the blast occurred. The explosion was terrific, and soon after three other blasts were heard. The four men endeavored to get to their fellow workmen, but found the chute and shaft choked with rock.

Retimbering operations have been under way in the upper part of the mine in which the so-called air blasts usually have occurred. The upper levels are in the abandoned or worked out portion of the property. Air blasts in the active workings in bottom levels are infrequent, and few men, in Quincy's 79 years of operation, have lost their lives through this cause. No. 2 shaft is approximately 8,900 ft. in depth.

"Air blasts" are more or less a mystery as to their origin. Some men long associated with copper mining in the Lake Superior district believe the blasts are the result of earth tremors caused by slight slipping of strata. Others maintain the blasts are peculiar to Quincy and some other deep mines and are brought about by the settling of superincumbent rock in worked-out openings, causing violent compression of air elsewhere in the mine. Air blasts have been intermittent in occurence in the Quincy mine for many years, but no particular fear has been attached to them, because they have occurred mostly in the upper part or abandoned parts of the mine workings.

Arcadian Issues Circular

Arcadian Consolidated, in a letter to stockholders, states that it has entered negotiations "with interests which the management feels should ultimately completely finance the company's treasury; and, with the rise in copper metal prices which has been predicted for some time and which seems to be approaching, and with a continuation of the good showing of copper ground disclosed by the crosscut west from our New Baltic shaft, your company should enter the production stage with ample working capital, with the above negotiations successfully concluded. It is with a good deal of assurance as to the future of Arcadian Consolidated, and with the hope that the assessment stage is behind us, that this letter is being addressed to stockholders."

The circular states that it has been necessary to levy assessments from time to time to keep the property in first-class condition and carry on a conservative, constructive development campaign. "A contrary policy," says the statement, "would not have found our property in such excellent condition as it is today after the past few trying years."

C. & A. Develops More Ore in Campbell Shaft

Crosscut From 1,900 Level of Company's Junction Shaft Encounters Extension of Orebody

EIGHT PER CENT ore has been opened in Campbell shaft territory of Calumet & Arizona at Bisbee, Ariz., in a crosscut from the 1,900 level of the company's Junction shaft, according to advices received by officials at Calumet, Mich. The crosscut has penetrated the ore for 30 ft. This is a continuation of the immense orebody being developed in this shaft. The shaft is bottomed at a depth of 1,800 ft. The ore also has been cut at the 2,200 level by a crosscut from the Junction. To facilitate opening work, the shaft will be connected up with the 2,200, which will provide better ventilation and an easier means of handling ore and waste rock. Though the 2,200 level is the deepest point at which ore has been found, there is reasonable expectation that values extend to even greater depth. A similar condition holds true at the present top of the deposit at the 1,400 level, the ore probably extending above that point. High-grade ore has been opened in intervening levels between the 1,400 and 1,800, and since the first of the year the deposit has constantly widened and lengthened. Raises between the levels show the continuity of the ore.

Up to Oct. 1 of this year Calumet & Arizona produced 37,052,000 lb. of copper from all sources. Output in September was 3,614,000 lb. Production in 1926 was 45,222,216 lb., and output in 1927 will therefore be somewhat in excess of that in 1926. No attempt is being made to increase production, on account of the low price of the metal. Average yield of ore treated during the year will be about 5 per cent. This percentage could be easily increased if the price of copper warranted the mining of richer ores.

At the company's Verde Central mine, the formation is being opened by raises from the 1,000 level in the hope of encountering commercial ore.

Another Safety Record Achieved

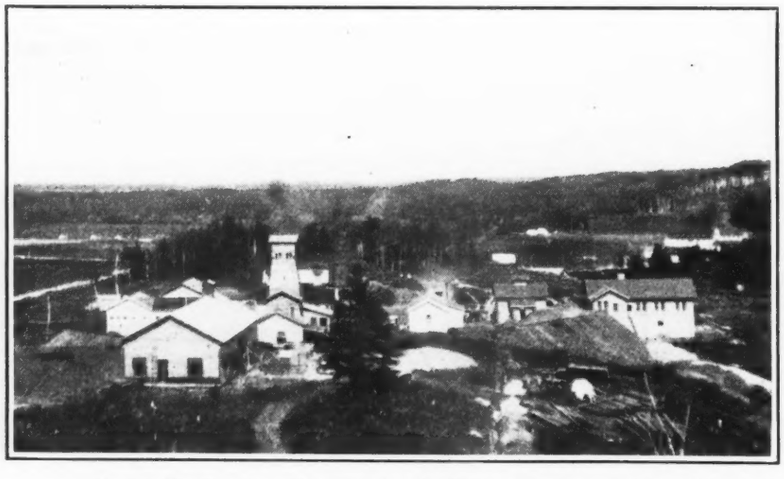
ONE of the most remarkable safety records for underground metal mines has just been announced by the Oliver Iron Mining Co. Section 16 mine of this company, situated at Ishpeming, Mich., has operated continuously for *seven years and three months* without a fatal accident. During this period, 1,192,436 man-shifts were worked at the mine.

Radio Waves Penetrate 600 Ft. of Rock

Recent tests made by the U. S. Bureau of Mines in the Caribou mine of the American Mining & Prospecting Co., at Caribou, Colo., indicate that radio waves will penetrate 600 ft. or more of rock strata. The experiment was performed in connection with the study of various methods of geophysical prospecting.

Errington Mine Erects Pilot Milling Plant

A pilot mill, which should be completed by the middle of February, is being erected at the Errington mine, in the Sudbury district of Ontario. Underground work at present is largely confined to making a connection between the two shafts, which are 3,600 ft. apart. This work, which is at the 300 level, is up to schedule, and the drive should be in the new shaft some time in November. This drive is not on the orebody, and at the present time practically no attempt is being made to develop ore underground. One raise, however, has been put up from the ore crosscut near the No. 1 shaft and shows an average grade a little better than was indicated by diamond drilling. Ample electric power is now available and progress is faster in all departments.



At the Errington mine, in the Sudbury district of Ontario

Nome Creek, Alaska, Dredges Report Good Returns

California Operators Investigate Kenai Peninsula—Tanna Valley Company to Enter Fairbanks District

DREDGES working on Nome Creek, in the Chatanika district, Alaska, and on American Creek at Hot Springs, are both doing well. The latter is a new dredge built by the Yuba Construction Co., and was put into commission for the first time on Aug. 18. It worked perfectly from the start. It is operated by Diesel engines, has buckets of 2½ cu.ft. capacity, is electrically lighted, and equipped with an 80-ft. steel flume. Construction of the dredge was completed in an unusually short period during the summer. The equipment was dispatched from Nenana by the Alaska Railroad on the first trip of the season. It was landed at Fish Lake Landing, on the Tanana River. Small boats took it up Fish River, whence it was taken over Fish Lake to the new wagon road. Over this it was transported four and a half miles to the dredge site. Construction of the hull was started on June 1, and within six weeks the entire plant was assembled and ready for operation. It is entirely a Fairbanks enterprise. The company holds 4½ miles of creek gravels, of an estimated content of 2,250,000 cu.yd. and an average value of 94c. The enterprise has an estimated life of from eight to ten years handling 1,500 cu.yd. per day during the working season. Airplane communication is maintained between the plant and Fairbanks, a landing field having been established at the dredge camp.

California dredge operators are investigating the Kenai Peninsula with a view to acquiring and testing promising areas of dredging ground. S. R. Capps, of the U. S. Geological Survey, has been examining the Copper Mountain area in the Toklat-Tonzona district. The principal minerals are argentiferous galena, sphalerite, and chalcopyrite, with some gold. Kantishna placers have produced gold to the value of over $500,000. The district is handicapped by its distance from transportation. It is 60 miles from the railway at Mount McKinley Station. On a 30-ton shipment of ore sent recently to the Selby smelter the transportation costs amounted to $70 a ton. The Tanna Valley Dredging Co., representing English capital, has plans in hand for beginning operations on Engineer Creek, in the Fairbanks district, where it has obtained extensive holdings. Fairbanks Exploration Co. will complete construction of its large power house at Fairbanks this winter. For some time a force of 400 men has been employed on the work. The first two dredges contracted for will be in operation the coming summer.

The Henderson, Wagner and Elmes Gold Mining Co.'s mills are all in operation this season, so that the lode-gold production of the Fairbanks district will be appreciable. A rich oreshoot has been struck on the Wagner. Ar-

rangements are being made for taking out a number of dumps on the creeks during the coming winter. On the Jesson property a ditch, 10,300 ft. long, has been constructed to bring in a supply of water for hydraulicking. The Hammar lease has produced gold to the value of $10,000 this season.

J. E. Groth, of Cordova, has bonded the group of claims at Port Wells, owned by A. Singletary, and plans to install a mill. Gold production of Cache Creek will be about the same as last year, but entirely from hydraulic operations. The Cache Creek dredge is not in operation this season, pending testing of new ground to which it is proposed to remove it. D. D. Muir and N. W. Rice, of the U. S. Smelting & Refining Co., are on a trip of examination of the works of the Fairbanks Exploration Co., a subsidiary which is developing the company's extensive dredging and hydraulic holdings and constructing the Chatanika ditch at Fairbanks.

The value of the copper production of Alaska for August was $441,000 below that for the corresponding period of last year. Several new discoveries of auriferous quartz are reported from Valdez Creek district. The leasers working the holdings of the McKinley Gold Placers Co. did well last summer and intend continuing operations throughout the winter months, when dumps will be taken out for summer washing. The Casa De Paga Mining Co., of New York, has acquired dredging leases and equipment on Seward Peninsula with a view to operation in the near future.

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Early Passage of Precious Stones Bill Expected

With the Flag Bill out of the way, the Precious Stones Bill will probably be the next legislation considered by the parliament of the Union of South Africa, according to the New York office of the Trade Commissioner for the Union. Early passage of this much amended and long-discussed bill is generally expected.

Concerning the present status of the bill and the South African diamond situation, F. W. Beyers, Minister of Mines and Commerce in the Union of South Africa, recently stated:

"The enormous increase in output from alluvial diggings was sudden and unforeseen. The part of the bill dealing with limitation and control of output was added in March, 1927. The rest of the bill was before Parliament in other forms as far back as 1923. The bill as it now stands will be passed in November next, and will give to the government ample power to limit output and to control diamond digging generally. The fact that the government has an interest of about 20 per cent in all diamonds produced is sufficient guarantee of adequate concern and control on the part of the government.

"Production from alluvial diggings is materially declining, and the overproduction has practically spent itself. The basic principal of the bill as regards alluvial diggings is, next to the interests of the government, to preserve them for the small man, but he must enjoy this privilege subject to proper control. Rushes are to be abolished and also the accumulation of a larger number of diggers than diggings can reasonably carry.

"The artificial increase of owners' and discoverers' claims by intensive subdivision of farms is also to be done away with. Registered syndicates and companies are to be restricted. The whole situation will almost automatically right itself as soon as the bill becomes law in November and is put into official operation."

Surface plant at Blue Bird mine of Silver Leaf Metals, Inc.

Silver Leaf Metals Operating Blue Bird Mine

ONE of the most promising of the older properties in the Cripple Creek district of Colorado to be reconditioned for a resumption of operations is the Blue Bird mine, on Bull Hill. This property was purchased last spring by Silver Leaf Metals, Inc., following the consideration of a favorable report on the mine made by the company's consulting engineer.

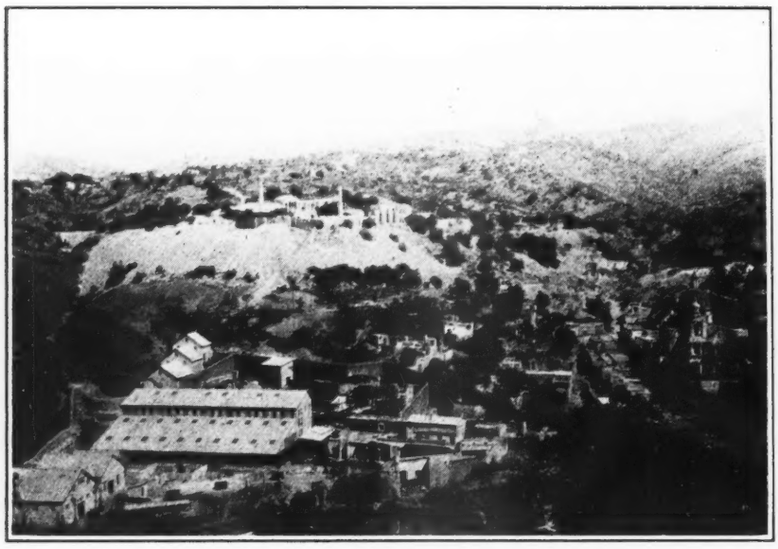
The surface buildings have been repaired and painted, and necessary equipment for active operations has been purchased. Electric power was brought in, and a 17-drill compressor with a 200-hp. driving motor was installed. In current operations, electric hoisting is used, a 150 hp. motor and a two-ton double-deck cage comprising the hoisting equipment. The main shaft is bottomed at 1,865 ft.; levels occur at 50 to 100-ft. intervals to this depth. Underground workings include 3½ miles of drifts along the veins and numerous crosscuts and raises. Much of these workings has already been retimbered by Silver Leaf Metals.

Operations to date have been devoted mainly to reconditioning work; however, 75,000 tons of gold-silver ore from the dumps has been shipped by the company to the Golden Cycle mill at Colorado Springs, 55 miles distant. The Midland Terminal railroad has a spur into the property, and, as it is more economical to ship the ore than to attempt to mill it at the mine, the erection of a mill is not under consideration. Exploration under way will extend the main shaft to the same depth as the shafts of the Cresson and Portland mines, which are two of the largest mines in the district. All ore encountered in sinking operations will be mined out as it is met. For a vertical distance of at least 400 ft. below the present bottom of the shaft water should not be a problem, as drainage is assured down to this point by the Roosevelt tunnel. The property, which has been idle for eight years, produced in the past ore to the value of $2,100,000. An estimate has been made that there is about 550,000 tons of ore in sight.

Officials of Silver Leaf Metals, Inc., are: E. N. Goodlett, president and general manager; J. N. Hincke, vice-president; F. E. White, secretary; George C. Carroll, treasurer. These men, with W. R. Lake, form the directorate. E. P. Arthur, of Colorado Springs, acts as consulting engineer to the company.

Tucson Interests Take Over Bonney Mine

Bonney mine, an old property in the vicinity of Valedon, N. M., has been taken over by a group of Tucson business and mining men and the shaft is to be sunk an additional 300 ft. to the 800-ft. point. The newly formed company is headed by Miles M. Carpenter, of Tucson, and a contract has been let to J. M. Thomas, veteran Arizona shaft contractor. The old Bonney mine, which is credited with a production of over $400,000, was under option last year to the Phelps Dodge Corporation. This corporation, however, decided not to exercise the option.



Cyanide plant of the Guanajuato Reduction & Mines Co., of Guanajuato, Mexico

Guanajuato Operators Markedly Reduce Working Costs

Cease to Look for Higher Silver Prices—Labor, Recognizing Companies' Difficulties, Is Quiet and More Efficient—Laws Cause Apprehension

THERE has been little change in the somewhat monotonous life of the old mining camp of Guanajuato during the last few months. Operators have ceased to look for higher silver prices in the near future and have accomplished wonders in reducing working costs. Labor, recognizing the companies' difficulties, has been quiet, and efficiency has therefore increased. Relations with both federal and state authorities have been comparatively satisfactory, though the expressed intention of the federal government to enforce to the letter the provisions of the new mining law is causing considerable apprehension in some quarters. It is feared that a material increase in operating costs and difficulties will result from the operation of the law. In other quarters, on the other hand, it is felt that the government will modify the law should it prove too irksome. Cia. Minera de Peñoles and the United Eastern Mining Co. are taking over two enterprises, which fact has naturally increased the prospect of a brighter future for the camp. Operations of these two companies are described below.

Peñoles Company Enters District

The Peñoles company has taken over the block of claims formerly known as the Mizpah, and is diamond drilling to explore them. These claims are between the Sirena and the Cedro mines, and have a length along the strike of the Mother vein of about two and a half kilometers. The vein in the south end of the Sirena mine is cut off by a strong fault, and it has always been thought that it had either pinched, or been split, into two stringers, which have been found, neither of which carry pay ore. The Alamitos tunnel, a long crosscut, was driven with the object of finding the vein, but it was stopped when it entered the footwall shales after having cut a narrow body of quartz slightly mineralized. Arthur Chippendale, a geologist, some years ago stated that in his opinion the narrow body cut was in reality nothing but the fault, the quartz and mineralization present being the result of drag. A few years ago, the ground became open for denouncement. and Mr. Chippendale immediately filed on it. He formed a syndicate which did some preliminary work and began a drill hole. The property was then called to the attention of the Peñoles company, which, after careful examination by four of its engineers, Messrs. Prescott, Fletcher, Hayward, and Bonillas, decided in its favor. Drilling was recently started by the company, and the hole has now reached a depth of 450 ft. This is the first piece of real exploratory work that has been undertaken in the camp for many years, and should the drilling reveal ore near the value of that showing in the Sirena stopes when the fault was encountered, much benefit will accrue to both the company and the district. R. W. Russell is in charge of the operations, and T. C. Seineke is doing the drilling.

It is understood that the United Eastern Mining Co., of California, will soon begin the erection of a 300-ton plant, which will later be increased to 600 tons for the purpose of treating a large deposit of old patio tailing in a bend of the Guanajuato River about five miles below the city. The tailing contains gold, silver, and mercury. Experiments on a large scale carried out by John Allingham, who has evolved a new process for the handling and recovery of mercury from tailing, under the supervision of James B. Stapler, representing the United Eastern Co., gave satisfactory results, and a contract was made with the owner of the tailing.

Operations of Guanajuato Reduction & Mines Co. at Capacity

Guanajuato Reduction & Mines Co. continues to operate at a capacity of 18,000 metric tons per month, the ore being drawn from mines on the Mother vein. H. P. Smith is general manager; Augustus MacDonald, assistant general manager, vice Harold T. Mapes, who resigned some months ago; C. C. Asethorpe is mill superintendent; and Percy Ramsden, cyanide-plant superintendent.

Guanajuato Consolidated Mining & Milling Co. is milling about 10,000 tons per month. The ore is mainly drawn from the Sirena mine, in which recent development work has shown satisfactory results, and the Peñafiel mine; a certain amount of ore from various outside sources being purchased as well. Dr. Alfred Wandke is general manager; O. Lampe mill and plant superintendent; and A. Magnani mine superintendent.

The Guanajuato Leasing Co., of which F. DeVotie is the principal shareholder, is operating the Tajo de Dolores mine under lease from the Providencia Mining & Milling Co. The fourth level has recently been unwatered, and ore of good value has been found. At present, from 600 to 800 tons of ore is being mined and sold to the Cubo Mining & Milling Co., but it is expected that this amount will soon be increased to 1,400. Norman Kurtz is in charge of operations.

The United Mines Co. is milling, and treating by the flotation process, about fifty tons per day of gold-silver ore drawn mainly from the Puertecito mines. The ore is of good grade and of a nature that lends itself to the flotation process, a very high percentage of recovery being obtained. Development work done lately in the company's Melladito mine has given encouraging results, and it is hoped to increase the tonnage milled before long. Dr. Alfred Wandke is general manager; Arthur Ramsden, plant superintendent; and J. Haskin, mine superintendent.

Cubo Mining & Milling Co. is treating about 5,000 metric tons of ore monthly from its Villalpando mines and from outside sources. Irving Herr is general manager of the property, S. C. Buchanan, plant superintendent, and L. F. Carrouché, mine superintendent.

Cia. Minera, Explotadora y Beneficiadora de Guanajuato is treating by flotation about 80 metric tons daily of ore from the San Cayetano mines. James Robertson is manager of the company.

At the Santa Ursula mine, in the San Nicolas del Monte district, leasers are mining small quantities of high-grade ore.

Much New Construction Work in British Columbia

Buena Vista Builds Trail to Premier Mine—Lucky Jim Completing Surface Plant

THE Buena Vista Mining Company, which is being formed to take over, equip, and develop the Big Missouri mine, situated 6 miles above the Premier mine, on the Salmon River, in the Portland Canal mining division, has a large force of men building a trail from the Premier mine to the property for the purpose of hauling in machinery over the winter snow. This trail will be made into a wagon road next year. A report from the district states that unseasonably heavy frosts are hampering the work.

A. G. Larson, president of the Lucky Jim Lead & Zinc Company, recently made the following statement about the company's property:

"The foundation construction work has been completed for the heavy machinery, and much of the machinery is on the ground. The equipment to come includes two semi-Diesel engines of 250 hp. each. Two bunkhouses and an office have been erected, but much other construction is in progress. Most of the work on the sewer system, the water for which will be taken from Bear Lake, has been done.

"Sixty-five men are at present employed on surface work. The underground work has been advanced proportionately to the requirements of the mill. The Canadian Pacific Railway has built a station at Zincton."

The Porter-Idaho Mining Company has received a smelter return of $14,777.49 for the first 40 tons of ore that it shipped this season. Up to date, since the season opened, the company has shipped about 150 tons of this class of ore. Recently it opened the Porter-Idaho vein at a depth of 400 ft. in its bottom tunnel, and it reports that the vein continues to hold both its width and value.

A single-line aërial tramway will be erected from the mine to the Marmot glacier, a distance of about 2,000 ft., and from there a road will be made to connect with the government road. The company estimates that this work, which it hopes to complete before winter sets in, will greatly reduce the cost of getting ore to tidewater—this now costs $50 per ton—and will enable it to move 10 tons of ore to the mouth of the Marmot River daily, instead of three, as at present.

Guilty Assayer Not Mayor of Grass Valley

E. J. N. Ott, mentioned in the Oct. 22 issue as having been found guilty of irregularities in connection with gold purchases in California, is not the mayor of Grass Valley, as erroneously stated by our correspondent. Apologies are hereby extended to the mayor.

Department Budget Officers Generous to Bureau of Mines

Bureau of Budget Held Responsible for Inadequate and Disproportionate Appropriations—Committee to Meet When Congress Convenes

By Paul Wooton
Special Washington Correspondent

REPRESENTATIVES of the mining industry who have been trying to get to the bottom of a situation which results in inadequate and disproportionate appropriations for this essential activity appear to be convinced that the real stumbling block is the Bureau of the Budget. The Department of Commerce has been severely criticized, principally on the ground that its budget officers have no first-hand knowledge of the mining industry and are not thoroughly in sympathy with the demands of the metal miners in particular. There is something to be said in their behalf, however. At the request of Senator Oddie the budget officer of the department has analyzed last year's budget to bring out the situation from a departmental standpoint. The hearings before Senator Oddie's committee at the last session of Congress dealt only with the estimates of the Bureau of Mines without reference to the situation which confronted the entire department.

The analysis now given to Senator Oddie discloses that the department made at least as generous an apportionment to the Bureau of Mines as to any other branch of the department, in the final estimates which were filed with the Budget Bureau for the fiscal year 1928. Although exact figures are not available, the analysis shows that by comparison with the appropriations for 1927, the increases recommended to the Budget Bureau by the department for the fiscal year averaged 3 per cent for all the services in the department, and that the increase for the Bureau of Mines was 7.1 per cent. This was by comparison with 6.8 per cent for the Bureau of Foreign and Domestic Commerce, 4.9 per cent for the Bureau of Standards, and 2.7 per cent for the Bureau of Fisheries, the other promotional branches of the department. Of the ten bureaus in the department, only the Bureau of the Census—whose appropriations must be adjusted from year to year to meet statistical inquiries required by law—fared better than the Bureau of Mines, receiving an increase of 9 per cent over the 1927 appropriation. These facts may serve to clear away the impression that the budget officers of the Department of Commerce have dealt less generously with the Bureau of Mines than with the other services in the department in the matter of the apportionment of funds.

Arguments on behalf of these appropriations last year had been confined to the staff of the department. The only outside voice that had been heard by the Bureau of the Budget was that of Senator Oddie. This year, in addition to the statements which have come from those sources, the Bureau of the Budget has heard orally from the president of the American Institute of Mining and Metallurgical Engineers, and has abundant documentary evidence from associations of mining men, indicating a broad public demand for more liberal appropriations.

Although Senator Oddie expects the Bureau of the Budget to do more for the mining industry this year than it did last year, he is convinced that the amounts which are being allowed will fall far short of the demands of the situation. For that reason he expects to carry through his plan to call his committee into session immediately on the convening of Congress, so that the budget in its final form may be laid before it and a plan of action to override it evolved.

Ruling of the Interstate Commerce Commission

Freight rates on scrap zinc in carloads from Waterbury, Conn., to Chicago should be found unreasonable in the opinion of William W. Disque, an attorney examiner for the Interstate Commerce Commission. The complaint was brought by the Federated Metals Corporation, which operates a smelting plant at Chicago. The rate assailed, 47.5c., is sixth class. The metals Corporation asks a rate of 32c. In a previous case rates on scrap lead and zinc in carloads from Pittsburgh to destinations in trunk-line and New England territories equivalent to 80 per cent of the sixth-class rates were found justified. The 32c. rate sought is on a much lower basis.

Anaconda Officials Banquet First-Aid Team

Officials of the Anaconda Copper Mining Company, including James R. Hobbins, W. B. Daly, and C. L. Berrien, respectively vice-president, manager of mines, and superintendent of mines, recently gave a banquet to the Anselmo champion first-aid team. This team won the international first-aid contest recently held at Pittsburgh, and thereby was the first first-aid team to bring the international championship to Butte. Members of the team are: Con O'Connell, captain; Louis Maillet, L. R. Maillet, Lou Bertoglio, Robert Gill, John Dickinson, and Hanford Esterbrook.

Toronto Letter

By Our Special Correspondent for Northern Ontario

Barry-Hollinger Results Stimulate Activity in Boston Creek Area

TORONTO, OCT. 22. — Better results being obtained from the Barry-Hollinger mine are stimulating activity throughout the Boston Creek district. It has been announced that the Hill Top mine, which has been closed for some time, is to reopen. At the Ostrom property, a few miles away, it is proposed to sink an incline shaft to a depth of 500 ft.; this work will be started immediately. The new mill of the Gold Hill mine is treating 50 tons a day. As a very narrow vein is worked on this property, it is proposed to carry narrower stopes than have hitherto been considered possible in this country. The mine is opened up to the 800 level, and at this depth there is more evidence of shearing than has been seen on the upper levels, which fact is considered to be a favorable indication for ore possibilities at greater depth. At the Barry-Hollinger property, the most favorable developments have been on the 1,000 level.

TO DATE, two oreshoots have been opened on this property; they are separated by about 40 ft. of barren rock. One of the shoots has a width in places of 14 ft. This is the most important shoot so far discovered on the property, and, as at the Gold Hill, there is much greater amount of shearing and schistosity than is seen in the upper levels. The management is so impressed with the possibilities at greater depth, that it has been decided to sink immediately to the 1,500-ft. point. The property is handicapped by the fact that it has only a small two-compartment shaft; if the favorable developments continue, a new shaft will be necessary. The mill is handling 100 tons of ore a day, the grade of which ore allows a fair margin of profit.

Reports from the Sherritt-Gordon property, in the same area, but distant about 40 miles, show it to be one of remarkable promise. The vein has now been traced by means of trenches and diamond drilling for a length of 19,000 ft. In 12,800 ft. of drilling only one hole failed to show ore. The average width over the major portion of the length is 17 ft.; the dip is 45 deg. At one place, however, the vein bends sharply, and here a maximum width of 480 ft. of ore of much higher grade has been disclosed. Arrangements are now being made to bring in a mining plant and to let a contract for an additional 30,000 ft. of drilling. It is understood that the Manitoba government will also guarantee the bonds of the extension of the road to the Sherritt-Gordon, provided a certain definite tonnage can be shown. Engineers think there is no question that this can be done.

The Whitney interests who have under option the Flin Flon property in northern Manitoba will shortly have to come to some decision, as the option expires on Dec. 1. Present indications point to the option being exercised, and, in that event, it is understood that construction work on the railway will be started almost immediately. At the present time a small pilot mill is operating, the concentrates being shipped for experimental treatment to the United States. The Sherritt-Gordon property, which is about forty miles from the Flin Flon, is considered by engineers who have recently returned from that section to have at least as great tonnage possibilities and an ore which will average about $2 a ton better than Flin Flon. At the present time work is being confined to diamond drilling.

An option was recently taken by the Towagamac Exploration Co. on a lead-zinc property in the Sudbury district. Exploration of the property is now under way. It is understood that the surface showed 5 ft. of mixed lead and zinc sulphide ore and that diamond drilling to a depth of 100 ft. confirmed these results. The company announced that should the results of this work be satisfactory, the finances needed for its further development will be secured by forming a subsidiary company for whose treasury stock Towagamac shareholders will have the first right to subscribe. This policy will be followed in the case of all other properties taken up by the Towagamac which give promise of developing into profitable mines.

It is understood that the shaft of the Howey Gold Mines, in the Red Lake district, is completed to the 500 level and a crosscut should be in the vein by the first of November. The results of this work will be watched with interest, as this development is more advanced than any other in that section.

McGraw-Hill and A. W. Shaw Companies Form Subsidiary

Incorporation of a subsidiary to publish four long-established national circulation industrial publications just acquired was announced today by the McGraw-Hill Publishing Company of New York and the A. W. Shaw Company of Chicago. The subsidiary is the McGraw-Shaw Company and the papers affected are *Factory, Industrial Management, Industry Illustrated,* and *Industrial Engineering.* Under the announced publishing plan, the first two papers will be combined as *Factory and Industrial Management,* starting with the January issue. The third paper will be consolidated with *Industrial Engineering,* a McGraw-Hill publication established in 1882, starting with the December issue.

Mexico City Letter

BY W. L. VAIL
Special Correspondent

National Mining Chamber Reorganized—Watches Labor Legislation

MEXICO CITY, OCT. 19—In the reorganization of the National Mining Chamber, with headquarters in this city, the following mining men constitute the executive committee: J. R. Woodhue, general manager of the smelting department of the American Smelting & Refining Company; A. F. Main, general manager of the El Oro Mining & Railway Company; Hugh Rose, general manager of the Mexican Corporation and Santa Gertrudis properties of the Camp Bird interests; George H. Harbordt, vice-president and general manager of the Peñoles company; and G. P. Garcia, of the Real del Monte interests. The chamber has taken new offices on Avenida Madero, City of Mexico, and has greatly enlarged its scope of activity. A résumé of what has been accomplished for the mining industry by the organization, with the co-operation of the principal officials of the industry throughout the republic, makes a very satisfactory record. The chamber is now watching with interest the progress of legislation relating to federalization of labor laws.

OWING largely to the persistent work of the Chihuahua mining chamber and that of the National Mining Chamber at Mexico City, substantial concessions have been secured from the Mexican government which will reduce the consular fees on articles imported for use in the mining industry.

The general operations of the Mazapil Copper Company operating in the states of Zacatecas and Coahuila, are in no way affected, according to official statements, by the closing of the lead smelter at Saltillo on Oct. 19. Work at the San Elio lead properties has passed through the oxide zones and is now in sulphides. The plant at Saltillo is not equipped to treat sulphide ores, and, as the oxides have been depleted, closing of the smelter at Saltillo has been foreseen for some time. About the first of the present year a concentrating plant for treating sulphide ores was constructed at San Elio, and at present the capacity of the plant is being increased to keep pace with mine operations.

The Ojuela drainage tunnel of the Peñoles mining company, which was started on June 1 of this year for the purpose of unwatering the old mines in the Mapami district, is reported to be about half completed. The contractors are driving about 650 ft. per month at the present time, but expect to increase this speed. In size, the tunnel is 9x9 ft. in cross section, and it will be approximately 6,000 ft. in length. Mexican labor, with exception of a few American supervisors, is used entirely in the work.

Johannesburg Letter

By John Watson
Special Correspondent

Transvaal Gold Production in August Constitutes Another Record

Johannesburg, Sept. 27.—The output of Transvaal gold for August, which was recently declared by the Chamber of Mines, constitutes another record for the industry. The figures were 863,345 oz., having a value of £3,667,256. The previous best monthly record was for March last, when the output reached 860,511 oz. The most notable increases were for New Modder, with an increase in production of 2,065 oz.; Government Areas, 1,669 oz.; Crown Mines, 1,605 oz., and Van Ryn Deep, 1,522 oz. E. R. P. M. showed a decrease of 4,266 oz., as compared with the company's July output. Native labor returns showed an increase of 677 "boys" working on the Rand gold mines on Aug 31, as compared with July 31.

At the Shamva gold mine, in Southern Rhodesia, there was recently a strike of 3,500 natives, who remained out on strike for a week. Twenty-two of the ringleaders, alleged to be concerned in wrongful acts, were arrested and brought to Salisbury, under police escort.

THE council of Rustenberg, in the Transvaal, has been notified by Potgietersrust Platinum, Ltd., of the company's intention to exercise its option to take out a mineral lease over town lands of Rustenburg as from March 31, 1928, for a period of twenty years. The council will receive £750 per annum and a further 12½ per cent of the profits.

Onverwacht Platinum, Ltd., during August crushed 2,430 tons of ore, which yielded 591 oz. of refined platinum metals, equal to 4.86 dwt. per ton milled. A prospecting winze has now reached the 500 level, where crosscutting is proceeding. From the 450 ft. to the 500 ft. point, the average value disclosed was 2.38 dwt. platinoids per ton. The company recently published a report for the year ended June 30, which shows that 23,673 tons of ore was milled during the twelve months and that 8,963.7 oz. of platinum-group metals was produced—a recovery of 7.57 dwt. per ton milled. The payable ore in the mine at the close of the financial year was estimated at 47,400 tons, averaging 7.4 dwt. platinoids. During the year, 8,322.9 oz. of platinum was sold, realizing £142,857 13s. net, or an average of £17 3s. 3d. per ounce. The net profit for the year was £90,781 17s. 3d., of which the two dividends absorbed £78,750. The recovery by concentration was 84.13 per cent, and the extraction by amalgamation of the concentrates was 99.47 per cent, giving an over-all recovery of 83.69 per cent. Lydenburg Platinum Areas, Ltd., reports that in the same month it milled 2,760 tons of ore, which yielded 590 oz. of platinum-group metals.

Experiments are being carried out in Southern Rhodesia by the government mining engineer in the hope of developing a simplified method of extracting platinum in small undertakings. From a head value of 2.8 dwt. a recovery of 1.9 dwt., or an extraction of 67 per cent, is being made. Total cost of treatment is under 10s. per ton. A large area along the Great Dyke, near Selukwe, was pegged a year ago for platinum. Mining there would be cheap, as no blasting would be necessary. The reef outcrops along the side of a hill and can be traced for miles.

Many diamond diggers who had left Zwemkuil, on the Orange River, near Prieska, Cape Colony, for the Transvaal fields, have now returned. The number of buyers visiting Zwemkuil diggings has now increased from three to six. Early in September, several stones, ranging from 5 to 8 carats, brought good prices. One diamond of 3½ carats was sold for £24 a carat, which is an exceptionally high price for a stone of this size. The diamond market in the Brakfontein district is reported good. A stone of 54¼ carats was recently sold for £830. One of 23 carats brought £520.

In the annual report of the Union government mining engineer, recently issued, the accident death rate for 1926 was shown to be 2.29 per 1,000 employees, which is a decrease of 0.11 per 1,000 compared with 1925. The increases in the value of the mineral output for 1926 compared with the previous year were mentioned as follows: For diamonds, £2,485,469; gold, £1,517,158; coal, £184,502; platinum, £93,307; asbestos, £64,351; corundum, £31,642, and for iron ore, £16,958. Decreases shown were: Osmiridium, £74,261; lead, £50,240; silver, £40,318; granite, £37,103, and copper, £19,367. The gold output for 1926 increased by 357,169 oz., and established a new record. The Secretary for Mines and Industries, states in the report: "Apart from the economic importance of the gold-mining industry to the country, it is interesting to note its value as a contribution to the world's wealth. Of the 928,000,000 oz. of gold produced in the world since its earliest records, the Union of South Africa has supplied 208,500,000 oz., or about 21 per cent of the aggregate world's production, and has now furnished more gold than any other country. The total value of the gold won in the Union up to the end of 1926 was £918,707,885.

Negotiations will soon be completed for the proposed railway into the manganese belt of the Postmasburg district in Cape Colony. The Central Manganese Co., with a capital of £12,000, has submitted its plans to the government; the matter will probably be considered by Parliament in the next few weeks.

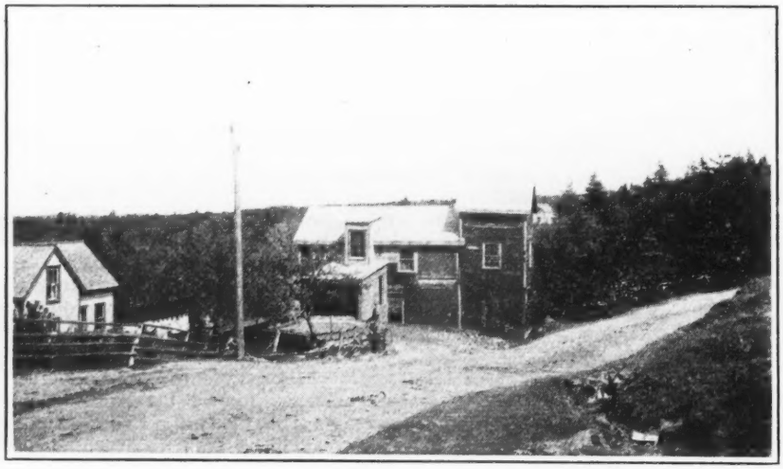
London Letter

By W. A. Doman
Special Correspondent

Unable to Reach Agreement in Plan to Stabilize Price of Tin

London, Oct. 18.—It is impossible to avoid referring to the position of tin, for, as far as metals go, it is the principal topic. Much has been said, and, in fact, a statement has been cabled from New York, concerning attempts to stabilize the price. In some quarters, considerable amusement has been caused as the result of a meeting of certain tin producers in London for co-operation and stabilization of the price at £300 per ton. I may mention that the suggestion to stabilize the price of tin has been before leading producers during the last twelve months or so, but it has not yet been found possible to reach an agreement. There seem to be, in fact, opposition camps; the camp of certain producers only and the camp of producers and refiners, with, as a kind of "Irish party," the metal merchants. Various unofficial statements concerning the position of affairs have been given out, and, although from some it would appear that there is a fair chance of an agreement being reached, others indicate that producers have no faith in the scheme and will not support it.

OPINIONS gathered from various quarters differ widely concerning the position. It was suggested in one direction that a group, composed mainly of speculators, but including some small producers, had been gambling not only in the share market but also in the metal market. It appears that these people are perturbed at the fall in the price of the metal, because, in the first place, so it is said, they have been bulling it, and, in the second place, some of the mines under their control cannot produce under £150 a ton. As a result this group is disappointed and is invoking the aid of big firms to put up the price and peg it at about £300. The figure of £300 seems to be suggested as reasonable because the known tin deposits are likely to be exhausted within, say, a decade or a little over. Unless the price is stabilized, people argue, it might go to £400 or £450 a ton. There is, of course, an obvious weakness in this argument. The merchants and some of the big metal firms do not thoroughly understand the suggestion of stabilization, and well-known economists who are paying attention to the matter doubt whether any such scheme as that proposed could be carried through, or, if carried through, could be made effective. At present, consumers, naturally, are not in favor of stabilization, for, though they can supply their needs at today's figure of about £262, there is no attraction for them in seeing it pegged for a long period at, say, £300 a ton.



At the Acadia gold mine near Oldham, Nova Scotia

The Eastern Tour of the Empire Mining Congress

By F. Lynwood Garrison
Mining Engineer

THE Maritime Provinces—namely, New Brunswick, Nova Scotia, and Prince Edward Island—are collectively one of the oldest parts of Canada and are very closely allied to the neighboring State of Maine in climate, physical features, and character of products. Nova Scotia and New Brunswick possess considerable mineral wealth, whereas Maine has practically little or none; but, nevertheless the last-named commonwealth seems much more prosperous than the provinces first named. The combined area of the three provinces is slightly less, and the total population about a hundred thousand more than Maine contains. Separated from Ontario and western Canada by the great wedge of Quebec, the people of the Maritime Provinces are closely related to New England in culture, blood, and historical tradition. Their young folks flock to Boston and other cities of the Atlantic seaboard for employment, and, experiencing a congenial environment, eventually, for the most part, make their homes there. The New England states admittedly should provide the natural and logical market for the products of these provinces. There can be no doubt that the present political and tariff barriers between these two contiguous localities impose needless hardship and relative poverty upon the fine people of these potentially rich and attractive provinces.

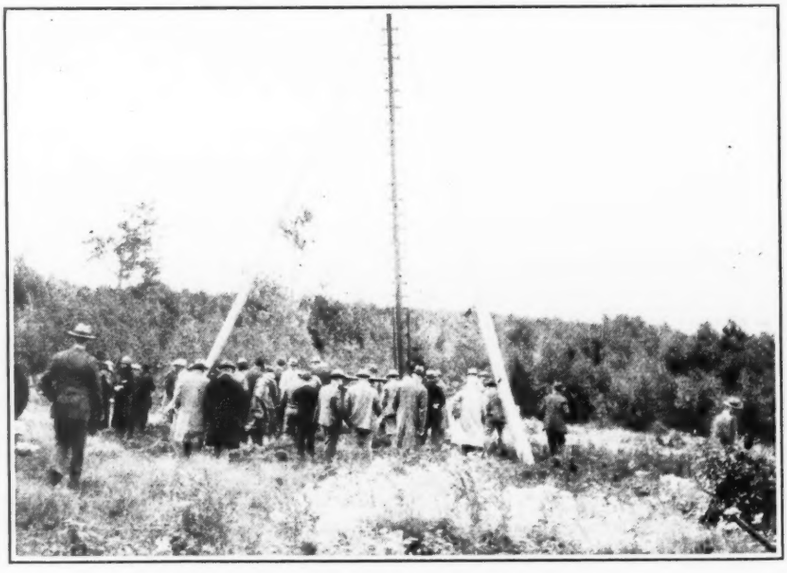
The mineral resources of New Brunswick are fairly well known, although only slightly developed, whereas Nova Scotia has been a mining country for about a century. Her coal and iron resources are famous, and her gold mines have struggled along for many years despite numerous obstacles and lack of adequate financial support. Nova Scotia has had, however, for a long time, a geological survey or mining department composed of some of the best and most-devoted men in the profession. The local government has always been generous and far-sighted, within its means, in encouraging the mining industry, and if the results have been sometimes disappointing it is not because the minerals are lacking or the courage and desire wanting to win them.

Moncton, New Brunswick, where our party found themselves on the evening of Sept. 7, is the second largest city of the province, having a population of about 20,000. The morning following our arrival found fine weather awaiting us for the trip by automobile to view the gas and oil wells of the New Brunswick Gas & Oilfields, Ltd., in the Stoney Creek district, south of Moncton.

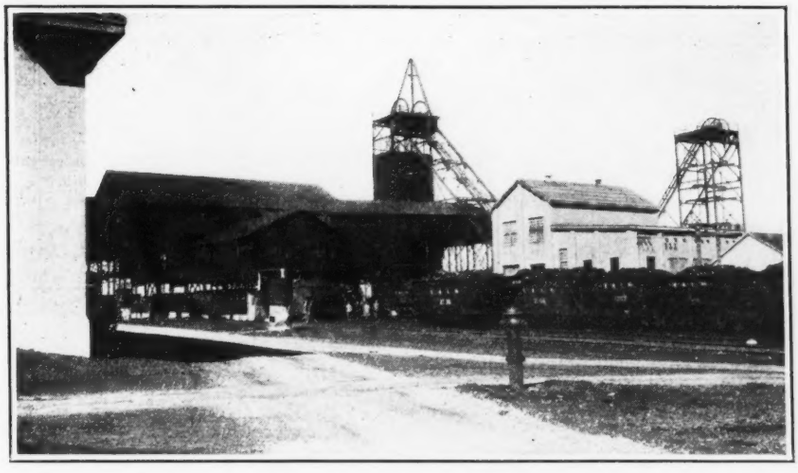
Conservation Seems Logical

We witnessed a courageous effort to gather oil where there seemed to be little, and to conserve natural gas of which there was evidently much. It appeared, however, to be a hard struggle against the heavy odds of cheap American and Mexican production. And, were not the enterprise under the direction of a skilled and accomplished engineer and geologist, the scheme would seem foredoomed to failure and loss, certainly as far as oil production is concerned. Would it not be better to postpone these efforts until such a time, not far distant, when production falls off in the great fields to the south and prices are correspondingly higher? Here surely it would seem there is a good opportunity to apply the sound doctrine of conservation. As it is, it seemed to us a losing venture under present conditions, unless the gas wells were paying, and as to that we had no definite information.

From the oil fields we were conducted to Hillsboro on the Petitcodiac River where we were shown the gypsum quarries and mills of the Albert Manufacturing Co. The quarries are actually underground mines, where the massive, snow-white gypsum is broken out from great chambers resembling some of the salt mines of Salzburg, in Austria. The underground haulage is by horse carts over dirt roads, the workings being lighted with the natural gas from the neighboring wells. Previous to going underground we were served a bountiful lunch at the beautiful home of the ladies



Inspecting a New Brunswick gas well



No. 1B colliery of the Dominion Iron & Steel Co., Ltd., on Glace Bay, near Sydney, Nova Scotia

of the Osman family who own the mines. These kind people gave themselves infinite trouble in entertaining us, and they may be assured that it was much appreciated.

From the gypsum mines we were taken to see an old working where the rare mineral albertite had formerly been mined in commercial quantities, but now long since abandoned and caved in. This material resembles jet and is described by Dana as an "inspissated and oxygenated petroleum in an irregular fissure in lower carboniferous rocks." The mineral has a scientific interest, but at present is of no commercial value. Our final experience in the Moncton district was a lobster supper at Shediac, a small summer resort on the shores of Northumberland Strait, a few miles east of the city. When we were confronted with that long, thin, red line of crustaceans running along the tables set for both guests and hosts, one could not but hope that lobsters, plus beer with a kick, might not prove our Waterloo. However, such fears were unfounded, since next morning no casualties were reported.

Oldham Gold Mine Interesting

From Moncton we proceeded overnight to Truro, Nova Scotia, where we breakfasted in the comfortable little hotel opposite the railway station. We were then given the choice of visiting the salt mines of Malagash or the Acadia gold mines near Oldham. I chose the latter, and had literally an insight into one of the most interesting gold mines it has been my luck to visit. It is an old mine with antiquated machinery, but seemingly it is being intelligently and systematically developed by Chicago capitalists. The ore of this mine is free milling and easily crushed; the percentage of recovery is said to be large. Small quantities of arsenopyrite, chalcopyrite, and a little galena occur occasionally in the ore. The veins are narrow, usually from one to two feet in width, but a thickness considerably greater is sometimes attained. They are ordinarily contact-bedded veins, between quartzite and slate, and often associated with cross stringers usually parallel with the strike but cutting across the dip of the strata. The beds of the formation have been folded by intense lateral pressure into rather steep anticlinals, producing a domed structure resembling the so-called saddle reefs of Bendigo, Australia.

A remarkable peculiarity of the Nova Scotia gold-quartz veins is a frequent corrugated or wavy structure, varying from broad open folds to close overturned ones, the degree of crumpling varying inversely as the thickness of the vein. The corrugations are said to be less frequent in the thin quartzite beds than in the slate (argillite). These waves or rolls are normally horizontal, with their length parallel to the axis of the anticlinal. The lamination of the associated slate follows the corrugations of the quartz of the veins. According to Faribault, there is sufficient evidence to show that strata favorable to the deposition of auriferous veins occur throughout the whole thickness of the lower quartzite and, perhaps, also, in the upper slate group, though apparently less frequently. He considers this an important fact with regard to deep mining on the domes of the anticlinals, and says that all the important gold mining centers are situated on these domes, and that a thorough knowledge of the structure of the anticlinals is necessary in order to locate the gold-bearing quartz deposits on the surface and to develop them in depth.

Studies by Faribault and Brunton

The district has been thoroughly studied by Faribault and Brunton, and their views are entitled to the greatest consideration. Neverthless, the gold-mining situation of the province has become a subject of a rather acrimonious discussion, in which I do not intend to take part, even if I knew anything about the situation from my own observations, which I do not. Some years ago the Nova Scotia government engaged the services of a distinguished mining engineer to visit the field and report upon the situation as a whole, hoping that new facts might be developed which would help the gold-mining industry, then, as now, a rather waning one. For some reason this report has never been published, which is a mistake, and unfair to the engineer who made it and to the public who paid him. The natural inference from this procedure has been that the report was very unfavorable, and the industry has suffered accordingly. The engineer has no defence because he cannot make public his findings or reply to the criticisms resulting from the episode. It would seem no more than fair in the circumstances for the government to employ a commission of disinterested technical men to review the situation, or, what would be even better, to study the field themselves. Our present knowledge of Pre-Cambrian geology is so incomplete, and has been so full of surprises as mining has progressed in it, that definite conclusions relating to its character are likely to be dangerous and certainly open to amendment.

Our visit at Oldham revived this subject in our minds, and we wished the few hours we had there might have been as many days. After a good dinner, we descended into the mine some 2,000 ft. by a long incline skidway, the little American lady of our party declining to be left behind. She climbed into the

The shore line at No. 1B colliery, Dominion Iron & Steel Co.

dirty iron bucket, and, following the trip down the skidway, scrambled through stopes, water, and muck with her distinguished husband. *Forti et fideli nil difficile.*

From Truro the party went to Sydney, where we arrived the morning of Sept. 10. For various reasons, our hosts at this point were obliged to change the official program, and the two days allotted for our stay in Sydney were reduced to one day. The visit planned for Fredericton and Minto had previously been omitted; the wonder is how the management of the party and railway officials were able to adhere as closely as they did to the set schedule. I do not know how the participants of the Western tour fared, but certainly the arrangements for the comfort and pleasure of the Eastern tour were beyond all praise. The people of Sydney were much hampered in caring for the party, as the largest hotel in the place burned down some weeks before we arrived and a new one under construction was not yet finished. This threw the burden of housing the party on the local Rotary Club, which succeeded very well, despite the fact that our original party had been considerably increased by others joining in Nova Scotia and by those who came over from Newfoundland to welcome us.

Under-Sea Coal Mines

The first point of interest at Sydney to all the visitors was, of course, the famous under-sea coal mines at Glace Bay, 14 miles east of town. We were accordingly conducted to No. 1B colliery of the Dominion Coal Co., Ltd., the newest and most important of the submarine operations. The colliery buildings and shafts are right along the seashore and well shown in the accompanying photographs. This colliery was completed in 1924 and was designed to handle 2,500 tons per eight-hour shift, but as a matter of fact it has averaged to this date 2,900 tons per shift. The amount of coal believed to be available for recovery through this shaft is estimated to give it a producing life of from 125 to 200 years, depending on such limits to extraction as experience alone can disclose.

Coal is mined from under the sea at three separated localities in Nova Scotia —namely, beneath the Atlantic at the entrance of and in the vicinity of Sydney harbor on the eastern shores of Cape Breton Island; beneath the Gulf of St. Lawrence off Inverness County on the western coast of this island; and beneath the upper reaches of the Bay of Fundy in the Joggins district of Cumberland County. With the exception of the Princess pit at the Sydney mines, sunk sixty years ago, the No. 1B colliery which our party visited is the only shore shaft deliberately designed for undersea operations. As I stood on the seashore taking the photographs relating to this colliery, I was impressed by the defenseless condition of all these mines. A hostile warship could here steam close to shore, and easily destroy the buildings and equipment and probably flood some of the workings. When it is remembered that probably all the other Nova Scotia collieries, with the possible exception of the Joggins, are almost if not quite as vulnerable, and that there is no other Canadian coal to be had east of Alberta, two thousand miles or more to the west, the seriousness of the situation must be apparent.

A Great Steel Plant

The great steel plant of the British Empire Steel Corporation, which we next visited, forms practically a town by itself, and is almost equally exposed in the event of war, although admirably located in other respects. Probably such a direful contingency was never contemplated as possible before the recent World War, but there can be no doubt that the danger exists. This great iron and steel plant is about as complete as such a works can be. The ore comes by water to great docks designed to handle it quickly and cheaply. Most of it is shipped from the company's mines at Wabana, or from those at Bell Island, in Newfoundland, which we were later to visit. The coal comes from the neighboring mines at Glace Bay and is coked in byproduct ovens at the steel plant, the byproducts being a source of revenue and economy. From the six blast furnaces the iron passes directly to the basic open-hearth furnaces for conversion into steel billets, thence to the rolling mills to be fabricated into various commercial articles from rails to carpet tacks. The great plant thus furnishes a complete cycle from ore to finished product.

At North Sydney our Canadian tour ended. Bidding adieu that night to our Canadian friends and hosts with an abiding respect and affection, we embarked on the "Cariboo" for Port-aux-Basques. Next morning, Sept. 11, we landed in what was to most of us a truly new found land.

Cornerstone Laid at University of Utah

ON OCT. 7, ceremonies were held at the University of Utah, Salt Lake City, marking the laying of the cornerstone of the new mines building which is being erected there to provide needed additional laboratories for the work of the research department in mining and metallurgy and for that of the U. S. Bureau of Mines, with which organization the research department of mining and metallurgy is co-operating.

The ceremonies were held under the auspices of the mining committee of the Salt Lake City Chamber of Commerce, of which J. O. Elton, manager of the International Smelting Co. is the chairman. The program had been arranged by a joint committee consisting of A. C. Moore, H. S. Joseph, George B. Doyle, representing the Chamber of Commerce mining committee; Ernest Gayford, chairman of the Utah section of the American Institute of Mining and Metallurgical Engineers; A. G. Mackenzie, secretary of the Utah Chapter of the American Mining Congress, and Leonard Cahoon, chairman of the Engineering Council, co-operating with Dr. Dorsey A. Lyon, supervising engineer of the Intermountain Station of the U. S. Bureau of Mines, George Thomas, president of the University of Utah, and Dr. Joseph F. Merrill, dean of the School of Mines.

After the laying of the cornerstone by Governor Dern, the Governor made an address, formally turning the building over to the School of Mines of the University. President Thomas then acknowledged the acceptance of the building by the university and was followed by Dr. Lyon, representing the Bureau of Mines. Short addresses were made by W. Mont Ferry, president of the American Silver Producers' Association, and by J. W. MacFarland.

Mining Congress Announces Program of Annual Meeting

"MINING, the Keystone of Industry," will be the theme of the thirtieth annual convention of the American Mining Congress which will be held at the Mayflower Hotel, Washington, D. C., Dec. 1, 2, and 3. High government officials, Congressmen, and leaders in the mining world will discuss important questions affecting the welfare and prosperity of the mineral and other industries of the country. Legislation affecting natural resources, mine taxation, modification of the anti-trust law, states' rights, individual initiative, and centralized government, will be the main topics for consideration.

Herbert Hoover, Secretary of Commerce, will discuss the "Economic Importance of Mining to the Nation," and Tasker L. Oddie, United States Senator from Nevada, chairman of the Senate Committee on Mines and Mining, will outline "What Is on the Legislative Calendar for Mining."

In a "Bureau of Mines Hour," which will be conducted by Director Scott Turner, the work of that federal agency will be considered.

"A Plea for Unity in Natural Resource Industries" will be made by Sydney J. Jennings, president of the U. S. Smelting, Refining & Mining Co.

William H. Lindsey of Nashville, president of the American Mining Congress, in his annual report will sound the keynote of the convention and advance a program of activity proposed by that organization. J. G. Bradley, of the Elk River Coal & Lumber Co., of Dundon, W. Va., will preside over one of the sessions devoted to consideration of legislation for natural resources. International centralization, as suggested by the recent Geneva Economic Conference, will be discussed by A. Cressy Morrison, of the Union Carbide Co., who attended that conference. H. N. Taylor, president of the U. S. Distributing Corporation, of New York, will preside over a session which will consider the advisability of modifying the anti-trust law in the interest of promoting the country's prosperity and commerce.

The Future of California's Mineral Industry

Extract From Address Made at Annual Conference of California Development Association, Oct. 27-28

By Frank H. Probert
Dean, College of Mining, University of California

THE FUTURE of California's mineral industry, as well as of the United States, depends in no small measure on the realization by the people of this commonwealth and of this country of their absolute dependence upon the indispensable mineral products, with which we are so bountifully blessed, and of their insistence upon the recognition of the industry by adequate financial aid from both state and federal sources, so that the pressing problems confronting mineral exploitation may be solved by the combined efforts of able men experienced in government, in business, and in science.

For 80 years human society has been in a process of reorganization, of increasing complexity, as our mineral lands have developed. Nearly all the commodities used by modern civilization are made from, or by the aid of, mineral products. To the products of the soil we look for human sustenance; mining, however, constitutes both warp and woof of the fabric of national growth and supremacy; and, moreover, the soil has been replenished and made to yield her increase in no small measure by the utilization of the byproducts of the mineral industry.

That mining is a great factor in our national prosperity cannot be gainsaid. Over two million men are employed in extracting and treating mineral substances, so that it is fair to state that 9 per cent of the entire population of the United States is directly dependent on the industry. The products of mines supply our railroad system with 50 per cent of its freight. Raw materials for the manufacture of most of the necessities, conveniences, and luxuries of life come from mines. From the returns of mining, the major part of all taxes in a score of states is paid.

The total value of the minerals mined in the United States last year was six and a quarter billion dollars. We lead the world in mining activity, still we import raw materials nearly equal in value to those we produce. Of this vast sum, the fuels, solid, liquid, and gaseous, account for three-fifths of the total value; metallics, ferrous, and nonferrous one-fifth, and the non-metallics one-fifth.

The total value of agricultural products in the United States for the same period is estimated at twelve billion dollars, barely twice that of mining. Professor Voorhies, agricultural economist of the University of California, is authority for the statement that in 1926 the value of crops on farms, unprocessed, was $469,000,000, from 10 to 20 per cent of which was fed to animals. The animal products were valued at $203,000,000. These figures do not include natural forage or forest products. The value of agricultural to mining products in California is in the ratio four to three, whereas for the country it is two to one. The statistical summaries of the United States Department of Labor show that the ratio of men directly engaged in the exploitation of our mineral resources, including iron and steel but not structural steel workers, to men following agriculture, forestry, animal husbandry, and the production of foodstuffs, is one to five and seven-tenths. One miner produces nearly as much wealth as three farmers.

Having thus established the relationships and importance of the two basic industries, inequities of governmental support are apparent when the budget for the current fiscal year shows that federal appropriations for agriculture and mining are in the ratio of 37 to 1, being $128,000,000 and $3,500,000 respectively—or, in other words, for every $1,622 value of mineral products the United States spends $1 in furthering the industry as compared to $1 for every $101 of agricultural produce.

Wholesale methods of exploitation characterize the mining industry of today in all the essential minerals. Vast resources are controlled by powerful interests; large sums of money are invested, a colossal daily output is maintained, machines now substitute for men, and great strides have been taken in excavating raw materials and in scientific knowledge of beneficiation processes. By integration and competent direction, by organized marketing, the risks of mining have in part been reduced. However, the ever-increasing consumption inevitably emphasizes the necessity of seriously contemplating the future, not with disconcerting alarm but with calm deliberation of ways and means to convert the discard of yesterday into acceptable material for tomorrow. Our mineral resources are exhausted as they are exploited, and nothing can be done to replenish them. It behooves us to give thought to the maximum utilization of these God-given goods consistent with sound business policies and national security.

Fritz Medal Awarded

On Oct. 21, the John Fritz gold medal for 1928 was awarded to General John J. Carty, of New York, for achievement in telephone engineering. The award was made unanimously by the board of sixteen representatives of the American societies of civil, mining, metallurgical, mechanical, and electrical engineers.

Dr. Max Mason Discusses Electrical Exploration for Ores

ELECTRICAL prospecting again furnished the theme for discussion at a regular monthly meeting of the Mining and Metallurgical Society of America, when the members, meeting jointly with those of the New York section of the A.I.M.E. at the Machinery Club on Oct. 27, listened to Dr. Max Mason, president of the University of Chicago, and others who are prominent in this work. Dr. Mason's remarkable paper, on "Electrical Exploration for Ores," was given close attention, as were his references to his work during the war in developing methods of detecting submarines. The paper, with the photographs and drawings that he used to illustrate it, will be published in its entirety in two parts in the Nov. 12 and Nov. 19 issues of the *Engineering and Mining Journal.*

After he finished, Dr. Mason was asked whether any work had been done on detection by radioactivity. The inquirer said he had also worked during the war on the detection of submarines, but had used a method based on the electrolytic action between metals and sea water. This method offered great possibilities, he thought.

Replying, Dr. Mason said that radioactive minerals would show effect readily, but that it would be quite hidden in the earth owing to the great amount of earth current normally present. Any method more delicate than that using self-potential he regarded as of dubious value.

Dr. von Buelow-Trummer, vice-president of the North American Exploration Co., was then called upon by the chairman, Arthur Notman. Dr. von Buelow's company, he stated, is working with all the methods in vogue.

G. C. Riddell asked what practical results had been obtained in the Missouri sheet ground district, where, he said, it would seem that conditions were ideally adapted to the use of geophysical methods. Replying for Dr. Mason, L. B. Slichter said that the methods had not been successful in the Tri-State district, because the ore was sphalerite, the only sulphide that is an insulator, and the orebodies complicated in shape and not dense. A. H. Rogers rose to say that Mr. Riddell meant the southeastern lead region; he added that the Swedish American Prospecting Corporation had done much testing on those ores in the laboratory and had found that the mineralization was not heavy enough.

Interesting results obtained in Canada by the Radiore Company with an electrical method based on the inductive system and using high frequency current were described briefly by E. H. Guilford, chief engineer for the company.

Mr. Leonardon, who is connected with the Schlumberger Electrical Prospecting Methods, also contributed interesting comment, which will be printed with that of others in an early issue.

Recent Technical Publications

A TEXTBOOK OF MINING GEOLOGY: By James Park. London: Charles Griffin & Co., Ltd.; Philadelphia: J. B. Lippincott Co., 1927. Fifth Edition, rewritten and enlarged. Pages, 364; figures, 91. Price, $5.

THE first edition of this textbook by the New Zealand geologist was published in 1906 and the preface to the present fifth edition was written in 1926. The work is divided into these chapters: I, Metallogenetic Epochs; II, Rock Alteration and Its Relationship to Ore Formation; III, Magmatic Differentiation; IV, Secondary Enrichment; V, Origin and Structure of Veins; VI, Morphological Classification of Ore Deposits; VII, Ore Deposits Genetically Considered; VIII, The Dynamics of Lodes and Beds; IX, Petroleum: Its History, Genesis, and Geology; X, Minerals Economically Considered; and lastly, chapter XI, Mine Sampling and Ore Valuation.

As will be seen from the above table of contents, the treatment is comprehensive and analytic; and if somewhat haphazard and inverted, still should allow a clear presentation of the subject. In general, this presentation is sententious, giving the impression of long compilation and the fitting together of many notes from much reading. The treatment, therefore, cannot be called inspired; it is rather marked by a conscientious determination to administer carefully prepared concentrated doses of knowledge concerning ore deposits to the student who is to be saturated with this branch of knowledge; and to do it thoroughly. In this it undoubtedly succeeds; the student who can absorb and retain a tithe of such multitudinous items of information will be a well-informed man. The presentation is, accordingly, didactic: it is the treatment of a teacher who is supposed, and supposes himself, to be presenting incontrovertible facts: this and that is thus and so—a very comfortable way to look at things. And the peruser need have no fear of anything heretical.

It results that any student—and the book is to be studied, not read—can get an unusual amount of varied information on his subject from this volume. This information is naturally not always complete; nor is it always well arranged. That is a criticism that can be made of most textbooks. Misstatements are relatively rare. Where the writer remarks (page 8) that in igneous rocks "the minerals possessing the highest melting point will be the first to crystallize, while the easily fusible will be the last to freeze," he is misleading, the significant fact being that this is not true, as his own listing of the order of crystallization in granite and diorite in the next sentence shows: doubtless, a rewriting of the quoted phrase would express more what the writer really meant. Nor does a paragraph like the following convey any accurate and useful information (page 25):

"The Pre-Cambrian epoch of mineralization is mainly characterized by bed-impregnation, and deposits of the dynamic and contact metamorphic types: Notably we have the iron-ore segregations of North America contained in the sedimentary rocks associated with the Keewatin; the magnetite and corundum ores in the sedimentaries of the Grenville series in the Adirondacks, and in Ontario; the Huronian iron-bearing formations in the Lake Superior region; the gold-bearing quartz veins in the Porcupine district, Ontario; the pyritic ores of Rio Tinto; the lead-zinc ores of Broken Hill; the gold-bearing veins of Mysore; the magnetic iron-ore segregations of Scandinavia, and the less important pyritic masses in the gneisses of the Scottish Highlands."

On the other hand, many conclusions are stated tersely and with valuable clarity, such as (page 62):

"The association of productive ores with carbon in one form or another, with carbonaceous and fetid limestones, and with base metallic sulphides, has been demonstrated in almost all parts of the globe." But the statement (page 131) that "The argentiferous lead ores of Leadville, in Colorado, have been described by Emmons as contact deposits occurring along the contact flows of eruptive porphyry dikes which have broken into and overlain a bed of dolomite limestone," although partially true, disseminates misinformation on a number of counts. This illustrates the ever-present danger of citations concerning regions, authors, and literatures with which the compiler is not personally familiar; and moreover emphasizes one of our most persistent faults in geological textbooks and other geological compilations.

The author does not always closely adhere to the proposed classification of the subject matter. The case above cited, of listing contact deposits in a morphological classification, is an instance, since the author defines these deposits as occurring at the contact of igneous rocks, which gives them a genetic classification. As another instance, in the chapter on "Minerals Economically Considered," there is a great variety of material not indicated by this heading, such as a discussion on the "Genesis of the Diamond" and much purely descriptive geology.

J. E. SPURR.

THE HORNE MINE AND SMELTER. The Sept. 30 issue of the *Canadian Mining Journal* contains an interesting description of the Horne mine and smelter. Ore treatment is described by K. Williams, and H. L. Roscoe discusses the orebody and the method of extraction which it is planned to use.

TESTING OF MEASURING TAPES AT THE BUREAU OF STANDARDS. Circular of the Bureau of Standards No. 328, Government Printing Office, Washington, price 10c. The pamphlet gives detail of the apparatus and procedure used in the testing and comparison of steel tapes for geodetic purposes. The procedure used in the checking of steel tapes and the conditions governing the issue of certificates in respect of the same are given.

ANNUAL STATISTICAL REPORT OF THE AMERICAN IRON AND STEEL INSTITUTE FOR 1926. Published by The American Iron and Steel Institute, 75 West Street, New York. Complete data covering production of pig iron, steel and ferroalloys, also the consumption of ore fuel and fluxes in blast furnaces are contained in this comprehensive statistical survey of the domestic steel industry.

THE ST. URBAIN AREA, CHARLEVOIX, QUEBEC, is the subject of a geological report by J. B. Mawdesley, published in Memoir 152 of the Canadian Geological Survey. Copies may be obtained on application to the Canadian Geological Survey, Ottawa. Price 20c.

RECENT PATENTS

DRUM MILL — No. 1,646,532. Oct. 25, 1927. Paul Goebels, Dessau, Germany.

A drum for tube mills divided into parallel chambers longitudinally.

REFINING OF IRON—No. 1,646,728. Oct. 25, 1927. George S. Evans. Assignor to the Matthieson Alkali Works, New York City, N. Y.

The iron is allowed to flow molten through an elongated passage and a powdered refining agent is introduced into the stream.

METALLURGICAL METHOD. No. 1,646,734. Oct. 25, 1927. John Wesley Marden. Assignor to Westinghouse Lamp Co.

A method for the production of metals of the group comprising uranium, thorium, zirconium, titanium, vanadium, tantalum, and tungsten by reducing the halide of one of these metals by means of an alkali metal and an alkaline earth halide.

DUMPING APPARATUS. No. 1,606,815. Oct. 25, 1927. Charles E. Glassen, assignor to the Columbia Quarry Co., St. Louis, Mo.

Rotary car-dumping device of new design.

CONCENTRATOR DECK. No. 1,646,985. Oct. 25, 1927. Albert H. Stebbins, Los Angeles, Calif.

A concentrating table so designed that a deep layer of tailings is confined upon it in order that they may be subjected to a panning operation.

MEANS FOR ROASTING METALLIC ORES. No. 1,646,050. Oct. 25, 1927. Henry Squarebrigs Mackay, London, England.

A multiple hearth roasting furnace constructed to secure accurate regulation of the roasting conditions on each hearth independently of the others.

Personal Notes

DR. GRAHAM JOHN MITCHELL has returned to Cananea, Mexico, from Butte and Salt Lake City.

F. W. BEYERS, Minister of Mines and Industries, recently left Southampton on his return to South Africa.

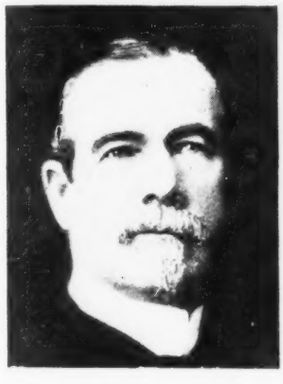
ERNST HARMS has returned to Los Angeles after several weeks of professional work at Salida, Colo.

R. R. MITCHELL has resigned the position of manager of the New Consort mine, near Barberton, in the Transvaal.

SIDNEY NORMAN is now connected with Stobie, Forlong & Co., a brokerage house in Toronto, in which city he will reside.

PHILIP L. FOSTER has been seriously ill from pneumonia during his present visit to London. He is, fortunately, now on the way to recovery.

L. R. ROBINS, at one time manager of the Belmont properties at Tonopah and later in Arizona, has established his residence in Oakland, Calif.



JOHN J. DALY

LEONARD J. BUCK, vice-president of William H. Muller & Co., is in Europe on business. He is expected to return to the United States in about a month.

CLIFFORD R. WILFLEY, of Denver, is examining the Golconda mine, in Hinsdale County, Colo. The property is under option to Kirby Thomas, of New York.

A. COOPER KEY, editor and proprietor of the *South African Mining Review*, accompanied by his wife and daughter, has returned to Johannesburg from a visit to England.

RUSH T. SILL, consulting mining engineer, at 1219 Pacific Mutual Building, Los Angeles, has returned from a visit to a number of mining districts in Arizona and New Mexico.

J. L. VAN EYSSEN, consulting engineer to Lewis & Marks, with GLEN BATEMAN, has left Johannesburg for the Lonely Reef mines, 40 miles north of Bulawayo, Bubi district, Rhodesia.

C. T. VAN WINKLE, Salt Lake City consulting engineer, has returned to Salt Lake after an absence of two months spent in Manitoba in making an examination of the Flin Flon mine.

H. A. GUESS, vice-president in charge of the mining department of the American Smelting & Refining Co., returned last week from an inspection of the company's Buchan's River development, in Newfoundland.

H. N. SPICER, of The Dorr Company, New York City, accompanied by Mrs. Spicer, has left for Australia, China, and Japan to be gone for several months, in connection with his company's interests in those countries.

E. H. CLIFFORD, consulting engineer for the British South Africa Co., spent a week in New York on his return trip to London, after participating in the Empire Mining Congress. He sailed on the "Aquitania" on Oct. 26.

Dr. SOKICHI KOH, professor of economic geology at the Kiushu University (Japan) and consulting engineer to the Imperial Steelworks at Fukuaka, Japan, recently visited Pretoria. He is making inquiries about manganese.

JOHN HAYS HAMMOND, of Washington, D. C., has been selected as one of three new members of the American Committee of the International Chamber of Commerce, his associates selected at this time being VAN LEAR BLACK, of the Baltimore *Sun*, and WALTER GIFFORD, president of the American Telephone & Telegraph Company, New York.

OBITUARY

OTTO PATTBERG, 51 years old, a mining engineer of Jersey City, N. J., died on Oct. 30 from a heart attack.

PETER BOAG, of the firm of Wright, Boag & Co., Ltd., engineers and founders, Johannesburg, died recently. He was born at Dunfermline, Scotland, and went to South Africa in 1881 and to Johannesburg in 1887. He was manager, for some time, of the Grahamstown Gold Mine.

HARRY L. BROWN, secretary of the Ohio Brass Company and formerly editor of the *Electric Railway Journal*, died at Toledo, Ohio, on Oct. 23. Starting as an editorial apprentice in the capacity of assistant editor of *Editorial World* in 1915, he served the McGraw-Hill Publishing Co., Inc., ten years. Mr. Brown was 38 years old.

DAVID WILLIAMS, publisher and sole owner of *The Iron Age* from 1868 to 1909, died at his home at Rogers Rock, Lake George, N. Y., on Oct. 29, at the age of 85. He was born in Waterford, Ireland, Dec. 23, 1841, and came with his parents to the United States in 1850. He graduated from the Middletown Academy in 1857. Two years previously the father, John Williams, began the publication, at Middletown, of a trade journal known as the *Hardwareman's Newspaper*. David Williams, who had learned the printers' trade, had to do with the mechanical part of the business. The journal first appeared under its present name, *The Iron Age*, in April, 1859. Mr. Williams was a charter member of the Engineers' Club and a member of the A.I.M.E.

FRANK J. WESTCOTT, secretary-treasurer of the Silver King Coalition Mines Co., and secretary of the Tribune Publishing Co. of Salt Lake City, Utah, died at Rochester, Minn. on Oct. 23.

F. J. WESTCOTT

Mr. Westcott was born on Oct. 12, 1858, at Russell, N. Y. After high school and college education he went West and entered the mercantile business at Park City. He later became associated with R. C. Chambers, general manager of the Ontario Mining Co. In 1901 he entered the employ of the late United States Senator Thomas J. Kearns, and since that time until his death he was an official in the various mining companies controlled by the Kearns interests. Mr. Westcott is survived by his widow, a son, and a sister.

JOHN JOSEPH DALY, one of that line of pioneers who made the Park City, Utah, district famous, died at Los Angeles on Oct. 22. Mr. Daly was born on Oct. 18, 1853. At the age of fifteen he joined a steamboat expedition up the Missouri River to Fort Benton, Montana, where for two years he worked as an Indian trader. From Montana, Mr. Daly went to White Pine, Nev., where he followed prospecting and mining. He had the good fortune to locate the famous Daly property, the producer of millions and now a part of the Park Utah Consolidated Mines Co. In 1880 he married Miss Eliza M. Benson of Liverpool, England. Later, he began the development of the Daly-West mine, which involved the expenditure of many hundreds of thousands of dollars before becoming one of the heaviest dividend payers of the camp. He was one of the founders of the Alta Club at Salt Lake City, and a regent of the University of Utah. He took a prominent part in Utah state politics. Surviving Mr. Daly are his widow and seven children.

Financial News

STATISTICAL NOTES

TRANSVAAL GOLD production continues at record-breaking figures, according to statistics issued by the Transvaal Chamber of Mines. The most recent data are shown in the accompanying table, the figures being given in ounces:

	1925	1926	1927
January	823,692	796,270	839,782
February	753,925	753,924	779,339
March	825,479	834,340	860,511
April	787,519	803,303	824,014
May	813,249	849,214	859,479
June	780,251	852,145	855,154
July	818,202	860,134	851,861
August	808,218	843,854	863,345
September	797,247	839,939	842,118
Total 9 months	7,207,782	7,433,123	7,575,603
October	812,832	853,296	.....
November	787,633	840,276	.....
December	791,455	836,157	.....
Total	9,599,702	9,962,852	.....

HOWE SOUND CO., which operates the Britannia copper mine, in British Columbia, and the Calera and El Potosi lead-zinc-silver mines, in Mexico, reports a material decline in earnings for the third quarter of the year, chiefly because of the decline in the prices of lead and zinc. The output of copper and lead and of the precious metals increased, but that of zinc declined. Financial returns are shown in the following table:

	Third Quarter	Second Quarter
Value of metals produced	$3,309,712	$3,340,125
Operating costs	2,653,819	2,616,697
Operating income	$655,893	$723,427
Miscellaneous income	83,011	85,060
Total income	$738,904	$808,487
Less depreciation	235,557	203,319
Net income	$503,347	$605,168

LAKE SHORE MINES—According to the report now in the hands of shareholders the Lake Shore Mines, Ltd., for the fiscal year ending June 30, 1927, 214,335 dry tons of ore was milled, yielding bullion to the value of $3,105,047, which represents an increase of 88,659 tons milled and an increase in the value of bullion produced of $870,000. The following is the summary of the profit-and-loss account:

Income	
Bullion produce	$3,105,047
Miscellaneous income	22,606
Total income	$3,127,654
Expenses	
Operating expenses	$1,236,916
Depreciation and depletion	329,670
Total expenses	$1,566,586
Profit	$1,561,066

SOVIET PLATINUM interests would be willing to resume "co-operation" with the European platinum trust if the trust would agree to allocate 5,000 kg. of the world's annual consumption of 6,000 kg. to Russia, according to a dispatch from Paris to Dow-Jones in New York. The refusal of the German and French interests to agree to such a division is alleged to have been the reason for the break some months ago which was followed by a decline in the market price from about $100 per ounce to $65.

RADIUM PRODUCTION IN BELGIUM, where the Congo ores of the Union Minière du Haut-Katanga are treated, was the same in 1926 as in the preceding year—namely, 20 gm. The world's consumption of radium fluctuates between 25 and 30 gm. Besides the Belgian plant there are two more in operation in France. The plants in Bohemia and in America have been closed.

CALIFORNIA RAND SILVER, INC., has issued a report for the fiscal year indicating revenue of $402,853, against about $510,000 expenditures and a deficit of about $100,000 for the year. As a result of improved conditions, dividends have been resumed, and a $64,000 disbursement was made in September. Economies and a better grade of ore enabled a surplus of $90,000 to be gained. Some three months' supply of ore is in sight.

THE FLOWERY MINES CO., operating a low-grade free-gold property about four miles easterly from Virginia City, Nev., has declared an initial dividend of 2c. per share, amounting to $20,000.

AMERICAN METAL CO. for nine months ended Sept. 30, 1927, reports net profit of $1,775,860 after federal taxes, depreciation and reserves. This compares with $2,098,881 in the corresponding period of 1926. Net profit for third quarter of 1927 was $587,588 after above charges, comparing with $602,197 in the preceding quarter and $705,728 in third quarter of 1926.

TEXAS GULF SULPHUR CO. reports net earnings of $2,936,189 for the quarter ended Sept. 30, 1927. Total reserve for depletion and surplus on Sept. 30 was $10,437,188; and total reserve for depreciation and federal taxes was $9,734,567.

PRODUCTION of iron ore in Hungary increased nearly 100 per cent in 1926 as compared with the previous year, say advices made public by the U. S. Department of Commerce. Production in 1925 amounted to 69,754 gross tons and in 1926 to 129,653 tons.

GRANBY CONSOLIDATED MINING & SMELTING CO. reports an appreciable decline in net earnings for the third quarter of the present year as a consequence of a decrease of about 1,300,000 lb. in production, a lower average price for copper sold, and an increase of 0.73c. per pound in production costs. The following table shows the results for the quarter.

	Second Quarter	Third Quarter
Net copper produced, pounds	14,800,127	13,259,896
Average monthly production, pounds	4,933,375	4,453,299
Average cost f.o.b. refinery, cents	9.153	9.887
Operating income	$503,933.38	$341,081.99
Miscellaneous earnings	46,873.24	45,071.60
Total income	$550,806.62	$386,153.59
Less bond interest	37,214.66	11,518.41
Net income	$513,591.96	$374,635.18

Canada's Production of Minerals Increases

According to the preliminary report on the mineral production of Canada, recently issued by the Ministry of Trade and Commerce, the production of metals and non-metals in the first half of 1927 registered a further advance. Although the output of gold was slightly less than during the first six months of 1926 the production figures of all other metals were higher than they were in the corresponding period of the preceding year. Slightly lower prices, however, reduced the value of the metal output by 7.8 per cent. However, the value of coal, natural gas and petroleum, together with the non-metallic mineral output, increased in value by 14.6 per cent.

Mineral Production of Canada, Jan. 1, to June 30, 1926 and 1927

		1926 Jan. 1, to June 30 Quantity	1927 Jan. 1, to June 30 Quantity	Per Cent Increase (+) or Decrease (—) Quantity
Antimony	Lb.	1,596	.....	.....
Antimony ore	Tons	76	.....	.....
Arsenic (AS_2O_3)	Lb.	2,287,801	3,667,004	+60.2
Bismuth	Lb.	6,440	.....	.....
Cobalt	Lb.	384,034	392,837	+ 2.2
Copper	Lb.	70,843,426	73,619,657	+ 3.9
Gold	Fine oz.	885,813	863,031	— 2.5
Iron, pig, from Canadian ore	Tons	.....	.....	.....
Iron ore sold for export	Tons	.....	830	.....
Lead	Lb.	138,397,755	152,275,563	+10.0
Molybdenite	Lb.	3,530	.....	.....
Nickel	Lb.	34,519,896	34,781,199	+ 0.8
Palladium, rhodium, iridium, etc.	Fine oz.	5,088	5,796	+13.9
Platinum	Fine oz.	5,166	5,374	+ 4.0
Silver	Fine oz.	11,108,310	11,723,218	+ 5.5
Zinc	Lb.	67,159,570	69,282,179	+ 3.2
Asbestos	Tons	132,644	123,730	— 6.7
Feldspar	Tons	13,135	15,926	+ 21.2
Graphite	Tons	1,371	899	— 14.4
Gypsum	Tons	250,369	331,893	+ 32.6
Mica	Tons	1,148	1,205	+ 5.0
Pyrites	Tons	7,615	21,418	+181.3
Salt	Tons	124,921	124,166	— 0.6
Talc and soapstone	Tons	7,888	7,831	— 0.7

The Market Report

Strength in Copper and Silver Features Metal Market

New York, Nov. 2, 1927 — Sales of copper, both in the United States and abroad, have been better than was generally expected, with the result that the price situation is firmer than for weeks. Silver has resumed its upward trend in price, today's quotation of 57¼c. per ounce being the highest since June 13. Lead demand has improved somewhat, but the price is no better. Zinc has been the weak sister among the metals, last week's break below 6c., St. Louis, having continued, with the 5¾c. level reached yesterday. Metal consuming lines continue generally active, though the current season's requirements are somewhat less than a year ago. The strength of the market depends upon an intelligent regulation of production to meet the slightly decreased demand. In this respect, copper seems in better condition than either lead or zinc.

Daily Prices of Metals

Oct. Nov.	Copper	Tin		Lead		Zinc
	Electrolytic, N. Y.	99 Per Cent	Straits	N. Y.	St L	St. L.
27	13 00	57 50	58 00	6 25	6 00	5 85@5 90
28	13 025	56 875	57 625	6 25	6 00	5 85@5 90
29	13 025	56 875	57 625	6 25	6 00	5 85@5 90
31	13 00	56 75	57 50	6 25	6 00@6 025	5 80@5 85
1	13 025	56 75	57 50	6 20@6 25	6 00	5.75@5 825
2	13 05	56 125	56 875	6 25	6 00	5.725–5 775
	13 021	56 813	57 521	6 246	6 002	5 831

Average prices for calendar week ending Oct. 29, 1927, are: Copper, 12.977; 99 per cent tin, 57.521; Straits, 58.229; N. Y. lead, 6.250; St. Louis lead, 6.000; zinc, 5.898, and silver, 56.208.

The above quotations are our appraisal of the major markets for domestic consumption based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis, as noted. All prices are in cents per pound.

Copper, lead, and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

In the trade, copper prices usually are quoted on a delivered basis; i.e., delivered at consumer's plant. As delivery and interest charges vary with the destination, the figures shown above are net prices at refineries on the Atlantic seaboard. Delivered prices in New England average 0.225c. per pound above those quoted, and prices at so-called Middle West destinations, 0.325c. above.

Quotations for copper are for ordinary forms of wire bars, ingot bars, and cakes. For ingots an extra 0.05c. per pound is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c. per pound.

Quotations for zinc are for ordinary Prime Western brands. Zinc in New York is now quoted at 0.35c. per pound above St. Louis, this being the freight rate between the two points.

Quotations for lead reflect prices obtained for common lead, and do not include grades on which a premium is asked.

London

Oct. Nov.	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic						
	Spot	3M		Spot	3M	Spot	3M	Spot	3M
27	56 3/8	56 3/8	62 5/8	264 3/4	261 1/2	20 9/16	20 7/8	26 9/16	26 5/16
28	56 3/8	56 3/8	62 5/8	262 3/8	259 3/4	20 3/4	21 1/8	26 3/4	26 7/16
31	56 9/16	56 9/16	62 5/8	261 1/2	258 3/8	20 13/16	21 3/16	26 5/8	26
1	57	56 15/16	62 5/8	259 5/8	256 3/4	20 3/4	21 1/8	26 1/2	26
2	57 7/8	57 11/16	62 7/8	258 1/4	255 3/4	20 1/2	20 7/8	26 1/2	26 1/4

The above table gives the closing quotations on the London Metal Exchange. All prices in pounds sterling per ton of 2,240 lb.

Silver, Gold, and Sterling Exchange

Oct.	Sterling Exchange "Checks"	Silver		Gold London	Oct. Nov.	Sterling Exchange "Checks"	Silver		Gold London
		New York	London				New York	London	
27	4.86 9/16	56 1/4	25 11/16	84s11d	31	4 86 9/16	56 3/8	26 1/16	84s11 1/4d
28	4.86 11/16	56 1/8	25 7/8	84s11 1/4d	1	4 86 7/16	56 7/8	26 1/8	84s11 1/4d
29	4.86 5/8	56 1/4	25 7/8	.....	2	4.85 3/8	57 1/4	26 1/4	84s11 1/2d
					Avg.		56.563		

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London silver quotations are in pence per troy ounce of sterling silver, 925 fine. Sterling quotations represent the demand market in the forenoon. Cables command one-half cent premium.

Averaged Metal Prices for October, 1927

COPPER:	
New York Electrolytic	12.958
London Standard Spot	55.119
London Electrolytic Spot	62.256
LEAD:	
New York	6.250
St. Louis	6.013
London Spot	20.479
London Forward	20.946
SILVER:	
New York	56.035
London	25.776
Sterling Exchange	486.533
ZINC:	
St. Louis	5.996
London Spot	26.899
London Forward	26.634
TIN:	
99 per cent	57.560
Straits	58.450
London	264.631
QUICKSILVER	126.200
ANTIMONY	11.165
PLATINUM:	
Refined	72.000
Crude	62.000
ALUMINUM, 98 PER CENT	25.600

Copper Sales Are Good

Most of the copper sold in the week ending today has been between 13.20 and 13.25c., delivered Valley, though one small lot went out as low as 13.175c. Three or four days ago, a good tonnage was sold in the Middle West at slightly higher prices than would be represented by the usual ⅛c. differential, bringing the f.o.b. refinery price average up to 13.025c. Today, most sales have been made at 13¼c. delivered Valley, though late this afternoon most if not all sellers advanced quotations to 13⅜c., at which at least one lot was sold. The foreign price was advanced to 13.70c. today, after an excellent week's business at 13.60c. These export sales have gone far to bolster up the position of some of the weaker domestic sellers.

Most of the copper sold has been for November shipment, perhaps a third being for December; certainly the greater part of the December requirements remains to be purchased, and a fair amount for November also. The total volume of sales was excellent.

Lead Market Steady

A fair volume of buying at unchanged prices, for the most part, has characterized the lead markets during the week. Virtually all of the transactions covered prompt or November shipment, neither sellers nor buyers being particularly interested in deliveries further ahead. The American Smelting & Refining Co. continued to maintain its official price for the New York territory at 6.25c. and a moder-

ate business was done at that level. A few sales were made at concessions from the Smelting company's price by one "outside" seller, but others found it possible to get 6.25c. In the Middle West the leading interest, possibly encouraged by a slight upward tilt in the London market, quoted 6.025c. and got it on several orders. However, the price was reduced the following day, and 6c. is the prevailing price today.

Consumption, both abroad and in the United States, continues to be reasonably satisfactory; but in spite of the talk of curtailment in production at the mines, statistics stubbornly refuse to reveal much change. The daily rate of world's output in September, according to the latest figures of the American Bureau of Metal Statistics, was 4,488 tons, against 4,380 in August and 4,550 in July.

Corroding grades bring the usual premium of from $2 to $3.

Zinc Weak at 5¾c.

The zinc market continues disappointing, both from the producing and consuming standpoints. Buyers seem well provided for their immediate requirements, and the low prices do not tempt them much. Production has not been cut to any extent, though some curtailment would appear to be the only remedy for the present situation. Much of the business for the week has been for forward delivery, even extending into January, some buyers at least being of the opinion that the present market is unduly depressed. Spot lots of High-Grade continue nominally at 7¾c. Prime Western in New York is at the customary differential of 35c. per 100 lb. above St. Louis quotations.

Weakness in Tin Continues

With the bears apparently in the ascendency in the London tin market, and everyone expecting further declines, buyers in the domestic market naturally have confined their purchases to immediate requirements only. The price has sagged each day, and with London cables off 27s. 6d. today, spot Straits is available at 56⅞c. December is about ⅛c. and January about ¼c. lower.

Silver Higher

During the past week the silver market has been quiet and steady, but closes firm today at 57¼c. Large buying orders from India have been the cause of the rise, but at this level China does not seem interested.

Mexican Dollars (Old Mexican pesos): Oct. 27th, 42⅞c.; 28th, 42¾c.; 29th, 42⅞c.; 31st, 43¼c.; Nov. 1st, 43½c.; 2nd, 43⅜c.

Foreign Exchange

The flurry in sterling exchange seems to be at an end. Closing cable quotations on the principal foreign exchanges on Tuesday, Nov. 1, were: francs, 3.92 5/16c.; lire, 5.46⅜c.; and marks, 23.875c. Canadian dollars, 3/32 per cent premium.

Zinc-Ore Price Drops to $37

Joplin, Mo., Oct. 29, 1927

Blende	Per Ton
High	$42.35
Premium blende, basis 60 per cent zinc	$38.00@ 39.00
Prime Western, basis 60 per cent zinc	37.00
Fines and slimes, 60 per cent zinc	34.00@ 36.00
Average settling price, all zinc	38.55
Galena	
High	$83.10
Basis 80 per cent lead	80.00
Average settling price, all lead	81.36

Shipments for the week: Blende, 15,676; lead, 1,775 tons. Value, all ores the week, $748,760.

Buyers closed the market in mid-afternoon today with a purchase of 11,700 tons of zinc concentrate. Selling was a drag and buyers were not anxious to increase the purchase. Report of the sale of a large tonnage of lead was received too late for confirmation. The intimation was that 2,000 tons would be removed from the stock held in bins, leaving approximately 14,000 tons.

Platteville, Wis., Oct. 29, 1927

Zinc Blende	Per Ton
Blende, basis 60 per cent zinc	$40.75
Lead Ore	
Lead, basis 80 per cent lead	$80.00

Shipments for the week: Blende, 1,069 tons; lead, none. Shipments for the year: Blende, 54,788; lead, 1,485 tons. Shipments for the week to separating plants, 1,839 tons blende.

Steel Prices Slightly Easier

Pig Iron and Coke Markets Dull, With Tendency to Lower Prices

Pittsburgh, Nov. 1, 1927

Even with the aid of some fair-sized bookings in rails, it is doubtful whether the total bookings of the steel industry were as heavy in October as in September, and rail buying was not as vigorous as in the annual movement of a year ago. In almost all lines except oil-country goods and automobile steel there is active buying, but in small individual tonnages. The two lines mentioned are seasonally dull, and in the remainder of the year seasonal dullness will be a factor in some other lines. No disposition to make preparation for the new year is yet evident.

Steel production in October was at approximately the same rate as the average of the three preceding months, the four months running 17 to 18 per cent under the rate in the first half of the year and about 15 per cent under the rate in the same months of last year.

Steel prices show a little easier position in several lines, but the only quotable declines are in blue annealed sheets, now at 2.10c. to 2.15c., and galvanized sheets, now at 3.65c. to 3.75c. There are suspicions that discounts on pipe have been increased again.

Pig Iron—The Valley market stays dull and there is increasing reason to believe that inquiry for substantial tonnages would bring out lower prices. Bessemer, $18; basic, $17; foundry, $17.50, f.o.b. Valley furnaces.

Connellsville Coke.—The market is practically dead. Prices hold as they are at or below bare cost of production. Heating coke, $2.65@$2.75; furnace, $2.85@$3; foundry, $4@$4.75.

Other Metals

Quotations cover large wholesale lots, f.o.b. New York, unless otherwise specified. London prices are according to latest mail advices.

ALUMINUM—Per lb., 99 and 98 per cent grades, price of leading interest, 25c.; outside market, 24.30@24.80c. Market still dull, following cut of 1c. on Oct. 20. London, 98 per cent, £104 @£107 per long ton for domestic consumption.

ANTIMONY—Per lb., duty paid, spot: Chinese brands, 11c. Market quiet. Cookson's "C" grade, spot, 17¾c.

Chinese needle, lump, 8c. Standard powdered needle, 200 mesh, 11c. White oxide, Chinese, 99 per cent Sb_2O_3, 15½c. Nominal.

BISMUTH—Per lb., in ton lots, $1.85@ $2.10. London, 8s. Domestic market continues below London parity.

CADMIUM—Per lb., 60c. London, 1s. 11d. for Australian metal.

COBALT—Per lb., f.o.b. Canadian works: Shot, 96@98 per cent, $2.50. Black oxide, 70 per cent, $2.10. London, 10s. for metal; 8s. for black oxide; 8s. 10d. for gray.

[1]GERMANIUM OXIDE—Per gm. in 300- to 500-gm. lots, $5.

IRIDIUM—Per oz., $105@$110 for 98 @99 per cent sponge and powder. $115 for pure metal. London, £20@£25.

LITHIUM—Per lb., 98@99 per cent grade in 1- to 5-lb. lots, $25.

MAGNESIUM—Per lb., in ton lots: 8-lb. ingots (3x3x16 in.), 98c.; 3-lb. sticks (1⅜x33 in.), $0.95@$1; 10-oz. sticks (1x12 in.), 85@90c. Market quiet. London 3s. 9d.@4s. 3d. for 99 per cent ingots or sticks.

[1]MOLYBDENUM—Per kg., 99 per cent, $25; chemically pure metal, $80.

MONEL METAL—Per lb. base price for shot, 28c., f.o.b. Huntington, W. Va.

NICKEL—Per lb., ingot, 35c.; shot, 36c.; electrolytic, 39c. (99.75 per cent grade), for single lots of spot metal. London, per long ton £170@£175 according to quantity. Demand continues good.

OSMIUM—Per oz., $60@$65; London, £11@£13.

PALLADIUM—Per oz., $52@$53. Small lots bring up to $56. Pure metal as a constituent of crude platinum, nominal. London £9½@£11½. Nominal.

PLATINUM—Official price quoted by the leading interest on small miscellaneous orders for refined metal, per oz., $72. Dealers and refiners quote the trade for refined metal, per oz., $64@ $65, cash. Market somewhat more active.

London, per oz., £13⅝@£14 for refined; crude and scrap, nominal.

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[1]Price furnished by Foote Mineral Co., Philadelphia.

QUICKSILVER—Per 76-lb. flask, $126 @$128. Active. San Francisco wires $128. London firm at £22½@£23.

RADIUM — Per mg. radium content. $70.

RHODIUM—Per oz., $50@$52; London, £8@£11½. Nominal.

RUTHENIUM — Per oz., $35@$38. Nominal. London, £6@£8½.

[1]SELENIUM—Per lb. in ton lots; Black, powdered, amorphous, 99.5 per cent pure. $1.90@$2. London, 7s. 6d. @7s. 8d.

TANTALUM—Per kg.: Bar and heavy sheet, chemically pure, $200. Firm. Leading producer is increasing furnace capacity.

TELLURIUM—Per lb., $2.

[1]THALLIUM METAL—Per lb.: Ingot, 99 per cent pure, $12 in 25-lb. lots.

TUNGSTEN POWDER — Per lb. contained tungsten, 97 to 98 per cent pure, $0.95@$0.98.

[1]ZIRCONIUM METAL—Per lb., 98 per cent grade, $15 in 5- to 10-lb. lots.

[1]ZIRKITE—Per lb.: Powdered, 80 per cent ZrO_2, 3c. Brick, straights, 80c.@ $1 each.

Metallic Ores

CHROME ORE—Per long ton, f.o.b. Eastern shipping points, $22.50@$23.50 for 45 to 50 per cent Cr_2O_3 ore. Prices firm.

IRON ORE—Per long ton, lower Lake ports. Lake Superior ores.

Mesabi, non-bessemer, 51½ per cent iron, $4.25. Old Range, $4.40.

Mesabi, bessemer, 51½ per cent iron, $4.40. Old Range bessemer, 51½ per cent, $4.55.

Eastern ores, cents per unit, delivered at furnaces: Foundry and basic, 58 to 63 per cent, 8.75@9c.

Foreign ores, f.o.b. cars Atlantic ports, cents per unit:

Swedish and Norwegian, low-phosphorus, 68 per cent, 10½@10¾c.

North African, low-phosphorus, 11 @11½c.

Spanish foundry or basic, 50@54 per cent, 9.50@9.75c. Nominal.

Swedish foundry or basic, 66@68 per cent, 9.50@9.75c.

MANGANESE ORE—Per long ton unit of Mn, c.i.f. North Atlantic ports, minimum 47 per cent Mn, 36@38c. Caucasian (washed), 53@55 per cent, 38@40c.

Per ton in carload lots:

[1]Chemical grades, powdered, coarse or fine, 82@87 per cent MnO_2, Brazilian and Cuban, $70@$80. Domestic, 70 to 72 per cent, $40@$50.

TANTALUM ORE—Per unit of Ta_2O_5, basis 65 per cent ore, $13.

TITANIUM ORE—Ilmenite, per gross ton, 52 to 60 per cent TiO_2, f.o.b. Atlantic seaboard, $10@$12, according to grade and impurities. Low-grade domestic, 32 to 35 per cent, about $7@$8 per gross ton. Rutile, per lb., 96 per cent concentrate, 11c. to 13c.

TUNGSTEN ORE—Per unit of WO_3, N. Y.: Wolframite, $10.15@$10.25, Western scheelite, $10.35@$10.60. Market dull, prices largely nominal.

Non-Metallic Minerals

Prices received for non-metallic minerals vary widely and depend upon the physical and chemical characteristics of the commodity. Hence the following quotations can serve only as a general guide to the prices obtained by producers and dealers in different parts of the United States for their own product. In the last analysis the value of a particular non-metallic mineral can be ascertained only by direct negotiation between buyer and seller.

[1]AMBLYGONITE—Per ton, f.o.b. mines: 8@9 per cent lithium oxide, $50@$60.

ASBESTOS—Per ton: f.o.b. Quebec mines, tax and bags included, prices quoted by leading interest.

Crude No. 1, $575; crude No. 2, $375; spinning fibers, $225; magnesia and compressed sheet fibers, $160; shingle stock, $60@$125, various grades; paper stock, $45@$50; cement stock, $25; short fibers, $10@$20; floats, $15. Market fairly active for all grades above paper stock. Higher prices forecast for 1928 delivery on all of the better grades.

Per ton c.i.f. New York: Rhodesian crude No. 1, $450; No. 2, $350.

BARYTES—Per long ton: f.o.b. mines, bags extra:

Georgia: Barytes ore, crude, $8. Wet ground, off color, $12@$18, depending on analysis. Shipments steady.

Missouri: Water ground and floated, bleached, $23; $25 in less than car lots, f.o.b. works. Crude ore, 93 per cent $BaSO_4$, not to exceed 1 per cent iron, per ton, $8, f.o.b. mines. Market fair.

BAUXITE — Per long ton: No. 1 chemical ore, over 60 per cent Al_2O_3, less than 5 per cent SiO_2, and less than 2 per cent Fe_2O_3 $8, f.o.b. *Georgia* mines. Prices firm but demand rather light.

Per metric ton, foreign, c.i.f.: Dalmatian, low SiO_2, $5@$6.50; Istrian, $5.50@$7; French, red, $6@$7.50.

BORAX—Per lb.: Carload lots, in bags, crystals, 4c.; granulated or powdered, 3¾c.; f.o.b. plant, Pennsylvania. Market slow, prices off ¼c.

[1]CELESTITE—Per ton in carload lots: 90 per cent $SrSO_4$, finely powdered, $27.

CHALK—Per ton: Crude in bulk, c.i.f. *New York*, $4.75@$5.

CHINA CLAY (KAOLIN)—Per ton: F.o.b. *Virginia* mines, crude lump, No. 1, $7; crude No. 2, $5.50; washed, $8; powdered and air-floated, $10@$15; ground, $7@$10.

Florida, pressed pottery, bulk, $13; ground, No. 1, $20; No. 2, $15. Sprayed mineral flour No. 1, $20; No. 2, $17.

Best grade, domestic, $16@$18. f.o.b. *Delaware* plants in carload lots. Firmer tendency to market.

Imported English, f.o.b. American ports: Lump, $13@$21; powdered, $45@$50. English Clay Producers Association has announced an advance of $2 per ton on lower-priced grades for 1928.

[1]Price furnished by Foote Mineral Co., Philadelphia.

DIATOMITE — Per short ton, f.o.b. plant:

Kiln-fired brick, $65; kiln-fired aggregate, ¼ in., $45; insulating powder, $25; natural aggregate, ¼ in. $20; air-floated powder, $45. Over 85 per cent silica, 98 per cent through 200 mesh, $25@$26, depending on quantity. Market fair to good.

EMERY — F.o.b. *Pennsylvania* and *New York* in 350-lb. kegs, per lb.: Greek Naxos, 6½c.; Turkish, 6½c.; Khasia, 5½c.; domestic, 3½c. Market good.

FELDSPAR—F.o.b. mine or grinding plant:

North Carolina, per long ton, No. 1 pottery grade, crude, $5.50@$7.50. No. 1 grade, 140 mesh, $16; 200 mesh, $18. No. 2 grade, 20 mesh, $10; 140 mesh, $13.50; 200 mesh, $15.

New Hampshire, per ton: Pottery grade, $8.50. Best quality lump, $9. Market good.

New York, Per ton: f.o.b. cars, No. 1 crude, $9. Market very quiet.

Tennessee, per ton: No. 1, pottery, 140 mesh, $16; 200 mesh, $18. No. 2, enamel, 140 mesh, $13.50; 200 mesh, $15; increased demand.

Maine, per ton: Best pottery grade, ground, $19. Market fair.

FLUORSPAR—Per ton: F.o.b. *Kentucky* and *Illinois* mines.

Gravel, not less than 85 per cent CaF_2, and not over 5 per cent SiO_2, $16. Quiet. Foundry lump, 85-5, $18@ $19. Ground, 95 to 98 per cent CaF_2, and not over 2½ per cent SiO_2, $32.50 in bulk; $36.50 in bags or barrels. Acid lump, 98-1, $30 in car lots. Demand extremely quiet because of slackness in steel operations. Action on Tariff Commission on application for increased duty awaited with much concern.

New Mexico: 85-5 gravel, $16.50; 85-5 lump, $16; 90-4 lump, $19; 96-3 ground, 100 mesh, $35, bulk. Market good.

Foreign spar, duty paid, $16, tidewater.

FULLER'S EARTH — Per ton, f.o.b. *Florida:* 16 to 30 mesh, $16.50; 30 to 60 mesh, $18; 60 to 100 mesh, $14; 100 mesh up, $8; 200 mesh up, $14. Market fair at unchanged prices.

Powdered, import duty paid, $24@ $25 per ton.

GARNET — Per ton; domestic, f.o.b. mines, $85. Market easy.

Spanish grades, $60, c.i.f. port of entry.

GILSONITE — Per ton, carload lots, f.o.b. mines *Colorado:*

Selected grade, $33; seconds (mine run), $25.50.

GRAPHITE — Per ton: F.o.b. *New York.*

Ceylon lump, 8@8½c.; chip, 7@7½c.; dust, 3@5c.; Madagascar flake, 7@8c. Market fair.

No. 1 flake, 8c.; fine flake, 6c. Foundry facings, 3c. Amorphous, fine ground, 3c.; fine ground crystalline, 3c. Crude amorphous graphite, $15@$35 per ton, according to grade.

GREENSAND—Per ton, f.o.b. cars, *New Jersey:* Screened and bagged, best grade in carload lots, $25. More inquiries indicate better business.

GYPSUM—Per ton, f.o.b. mill, depending upon location: Crushed, $2.75@$3; ground, $4@$10; agricultural, $6@$15; calcined, $8@$10.

IRON OXIDE (See Ocher)—Per lb.: Standard Spanish red, 2½@4½c.; domestic earth, 2@4½c.

KAOLIN—See China Clay.

[1]LEPIDOLITE—Per ton: $20@$30 for ordinary grades. Nominal.

LIMESTONE—Per ton: f.o.b. shipping points, depending on location, either lump or crushed, 75c.@$2.

Agricultural, 75c. up to $4 or $5 for crushed or pulverized. Prices depend upon source, purity, and fineness.

MAGNESITE — Per short ton, f.o.b. *California* mines: Grade "A" calcined, 80 per cent through 200 mesh, $40; grade B, $38; dead burned, $30@$32; crude, $14. F.o.b. Eastern seaboard, calcined, $40. Market weak.

MICA—Per ton, f. o.b. plant:

New Hampshire: Mine run, $300; clean shop scrap, $25; mine scrap, $22. White dry ground, 20 mesh, $25; 40 mesh, $40; 60 mesh, $65; 100 mesh, $80; 200 mesh, $100. Market fairly active and somewhat firmer.

North Carolina: White, ground, 20 mesh, $35; 70 mesh, $100.

Madagascar, amber, dark, free from iron, per lb., f.o.b. *New York,* duty paid: Special, $3.50@$4. No. A1, $3@$3.50; No. 1, $3; No. 2, $2.50@$2.75; No. 3, $1.25@$1.30; No. 4, 70@80c.; No. 5, 45@55c. Market strong.

[1]MONAZITE—Per ton: (Minimum 6 per cent ThO_2), $120.

OCHER — F.o.b. *Georgia* mines, per ton: $19@$20 in sacks; $21@$22 in barrels; washed and water floated, $18; second grade, 99 per cent through 225 mesh, $18. Market poor.

PHOSPHATE—Per long ton, f.a.s. or f.o.b. mines:

Florida, pebble, f.a.s., for export: 76@77 per cent, $7; 75 per cent, $6.25; 74@75 per cent, $6; 70 per cent, $4.50; 68 per cent, $4.10; 66 per cent, $4. Prices firm.

Florida, pebble, domestic: 76@77 per cent, $6; 74@75 per cent, $5; 72 per cent, $4; 70 per cent, $3.50.

Tennessee, ground, 97 per cent through 200 mesh, 33 per cent P_2O_5, $9.40 per ton. Brown lump for acid manufacture, per gross ton, $5.50 on 75 per cent basis; $4.50 on 72 per cent basis.

POTASH—The ruling contract prices are as follows:

	Bags	Bulk
Muriate of potash 80 @ 85 per cent, basis 80 per cent....	36.40	34.80
Sulphate of potash 90 @ 95 per cent, basis 90 per cent....	47.30	45.70
Sulphate of potash-magnesia 48 @ 53 per cent, basis 48 per cent	27.25	25.65
Manure salt 30 per cent.....	21.75	18.75
Manure salt 20 per cent.....	15.40	12.40
Kainit 14 @ 16 per cent.....	12.50	9.50
Kainit 12.4 per cent.....	12.00	9.00

Two thousand pounds net weight, c.i.f. Atlantic and Gulf ports. German weights, tares and analyses.

PUMICE STONE—Per lb.: In barrels, powdered, 2½@4c.; selected lump, 5@7c.

PYRITES—Per long ton unit of sulphur: Tharsis, c.i.f. U. S. ports; guaranteed 48 per cent sulphur, furnace size, 2½-in. diameter, 14c. Same price for fines screened through ½-in. mesh. Cinder from ore to remain property of buyers. Market improving on excellent inquiry.

[1]QUARTZ ROCK CRYSTALS—Per lb. in ton lots: Colorless, clear and flawed, pieces ¼ to ½ lb. in weight, 40c. For optical purposes, double above prices; larger crystals still higher.

SILICA—Per ton: Water ground and floated, in bags, f.o.b. Illinois; 400 mesh, $31; 350 mesh, $26; 250 mesh, $18. Market fair. Glass sand, f.o.b. producing plant, 75c.@$5 per ton; molding sand, 65c.@$3.50; blast sand, $1.35 @$3.50.

[1]SPODUMENE — Per ton: $20@$30, depending upon lithium content. Nominal.

SULPHUR—Per ton for domestic market: $18, f.o.b. Texas mines; $22 for export, Atlantic ports. Prices in reality are on a c.i.f. basis, but the average price reduced to an f.a.s. figure is about as given. Good shipment against contracts. Open prices $1 higher than above.

TALC—Per ton, carload lots, f.o.b. works, containers included:

Vermont: 99 per cent through 200 mesh, extra white, $10.50; 96 per cent through 200 mesh, medium white, $9.50; packed in 50-lb. paper bags. Competition active.

New York: Double air-floated, 200 mesh, $13.75; 325 mesh, $14.75. Demand fair.

Georgia: Powdered, gray, $7.50@$10; yellow, $9@$12; red, $11@$13; roofing, $7.50@$9. Market fair.

New Jersey: Soapstone, ground, $10 @$12; market good.

TRIPOLI—Per short ton, burlap bags, paper liners, minimum carload 30 tons, f.o.b. *Missouri:* Once ground through 40 mesh; rose and cream colored, $14. Double ground through 110 mesh; rose and cream, $17. Air-floated through 200 mesh, rose and cream, $25; mill run, $15. Business fair.

[1]ZIRCON—Per lb., f.o.b. mines in carload lots: 95 per cent, 3c.

Mineral Products

ARSENIOUS OXIDE (White arsenic)—Per lb. 4c. Quiet. London, per long ton, £18¼ for Cornish white.

CALCIUM MOLYBDATE — Per lb. of contained Mo, $1.20, delivered.

[1]Price furnished by Foote Mineral Co., Philadelphia.

COPPER SULPHATE (Blue Vitriol)—Per lb. in car lots, 5@5.10c., for either large or small crystals.

SODIUM NITRATE—Per 100 lb.; crude, ex vessel, Atlantic ports, $2.40@$2.45 for spot; future delivery, $2.40.

SODIUM SULPHATE (Salt Cake)—Per ton, bulk, f.o.b. works, $18@$20.

ZINC OXIDE—Per lb. in bags, in car lots: Lead-free, 6½c.; 10, 20 or 35 per cent leaded grades, 6⅝c.; French red seal, in bags, 9⅜c.

Ferro-Alloys

FERROCERIUM—Per lb., $5.50.

FERROCHROME—Per lb. of contained chromium, 60@70 per cent chromium, 4 to 6 per cent carbon, 11@11½c.

FERROMANGANESE — Per gross ton furnace: Domestic and foreign, 78@82 per cent, $90, Spiegeleisen, 19@21 per cent, $30@$31 on carload business, f.o.b. furnace. Market dull.

FERROMOLYBDENUM—Per lb. of Mo, f.o.b. shipping point, 50@60 per cent Mo, $1.25. Business good.

FERROPHOSPHORUS—Per ton, 18 per cent P, $91; electrolytic, 24 per cent, $122.50; f.o.b. *Alabama* and *Tennessee.*

FERROSILICON—Per gross ton, f.o.b. works, freight allowed on carload lots east of Mississippi River: 50 per cent, $85; 75 per cent, $135; 14@16 per cent, $45. Market fairly active.

FERROTITANIUM—Per ton: For 15 to 18 per cent material, $200, f.o.b. Niagara Falls, N. Y.

FERROTUNGSTEN—Per lb. of W contained, 75@80 per cent W, 92@95c., f.o.b. works. Quiet.

FERROVANADIUM—Per lb. of V contained, f.o.b works, $3.15@$3.50, depending on grade. Market good.

Metal Products

ROLLED COPPER—Sheets, 22c.; wire, 15¼c. per lb., f.o.b. mill.

LEAD SHEETS—Full rolled 9¾c. per lb.; clipped, 10c.

NICKEL SILVER—28¾c. per lb. for 18 per cent nickel Grade A sheets.

YELLOW (MUNTZ) METAL—Dimension sheets, 19¼c. per lb.; rods, 16¼c. per lb.

ZINC SHEETS—10c. per lb., f.o.b. works.

Refractories

CHROME BRICK—Per net ton, f.o.b. shipping point, $45.

FIRECLAY BRICK — Per M.: First quality, $43, *Ohio, Kentucky, Central Pennsylvania;* second quality, $35.

MAGNESITE BRICK—Per net ton, f.o.b. works: 9-in. straights, $65.

SILICA BRICK—Per M., *Pennsylvania* and *Ohio,* $43; *Alabama,* $51; *Illinois,* $52.

Metal Statistics

Monthly Average Prices of Metals

Silver

	New York		London Spot		Sterling Exchange	
	1926	1927	1926	1927	1926	1927
January	67.795	55.795	31.327	25.863	485.295	484.775
February	66.773	57.898	30.797	26.854	485.852	484.551
March	65.880	55.306	30.299	25.655	485.606	484.887
April	64.409	56.399	29.682	26.136	485.702	485.178
May	65.075	56.280	30.125	26.072	485.485	485.288
June	65.481	56.769	30.248	26.203	486.000	485.183
July	64.793	56.360	29.861	25.983	485.755	485.145
August	62.380	54.718	28.777	25.224	485.293	485.546
September	60.580	55.445	27.904	25.565	484.845	485.878
October	54.505	56.035	25.291	25.776	484.475	486.533
November	54.141	.....	25.192	.....	484.359	.....
December	53.466	.....	24.733	.....	484.553	.....
Year	62.107	.....	28.686	.....	485.268	.....

New York quotations, cents per ounce troy, 999 fine. London, pence per ounce, sterling silver, 925 fine.

Copper

	New York		London Spot			
	Electrolytic		Standard		Electrolytic	
	1926	1927	1926	1927	1926	1927
January	13.822	12.990	59.013	55.414	65.325	62.375
February	13.999	12.682	59.669	54.438	66.375	61.119
March	13.859	13.079	58.603	55.935	65.489	62.641
April	13.706	12.808	57.200	55.056	64.600	61.526
May	13.599	12.621	56.494	54.563	64.313	60.881
June	13.656	12.370	56.778	54.030	64.591	59.881
July	13.924	12.532	57.864	54.551	65.625	60.089
August	14.174	12.971	58.857	55.364	66.857	62.227
September	14.062	12.940	58.705	54.455	66.528	61.830
October	13.862	12.958	58.304	55.119	66.298	62.256
November	13.576	.....	57.293	.....	65.551	.....
December	13.302	.....	56.869	.....	64.114	.....
Year	13.795	.....	57.971	.....	65.472	.....

New York quotations, cents per pound. London, pounds sterling per long ton.

Lead

	New York		St. Louis		London			
	1926	1927	1926	1927	1926 Spot	1926 3 Mos.	1927 Spot	1927 3 Mos.
January	9.255	7.577	9.102	7.392	34.778	34.584	27.485	27.786
February	9.154	7.420	8.991	7.286	33.903	33.903	27.344	27.781
March	8.386	7.577	8.165	7.328	31.625	31.921	27.845	28.302
April	7.971	7.126	7.764	6.807	28.775	29.284	26.546	27.053
May	7.751	6.616	7.538	6.269	28.253	28.719	25.054	25.526
June	8.033	6.414	7.876	6.150	29.986	30.142	24.438	24.750
July	8.499	6.344	8.383	6.120	31.716	31.545	23.491	23.932
August	8.908	6.681	8.722	6.467	32.756	32.345	23.119	23.540
September	8.786	6.997	8.615	[illegible]	32.085	31.790	21.446	21.994
October	8.402	6.250	8.130	6.[illegible]	30.821	30.696	20.479	20.946
November	8.005	.....	7.800	.....	29.270	29.563	.....	.....
December	7.855	.....	7.688	.....	28.932	29.264	.....	.....
Year	8.417	.....	8.223	.....	31.075	31.146	.....	.....

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Tin

	New York				London	
	1926	1927	1926	1927	1926	1927
	99%		Straits		Spot	
January	61.415	64.785	62.275	66.415	282.038	297.804
February	62.653	66.528	63.705	69.142	287.107	306.125
March	63.472	67.833	64.505	69.199	292.288	313.315
April	61.962	66.069	63.389	67.933	281.388	302.572
May	60.165	63.935	62.305	67.510	270.125	294.938
June	58.409	64.226	60.611	67.466	268.352	296.006
July	61.365	62.625	63.091	64.110	282.102	288.690
August	63.875	63.523	65.260	64.431	293.690	293.193
September	66.535	60.735	68.895	61.490	306.273	280.432
October	68.225	57.560	70.245	58.450	312.548	264.631
November	68.667	.....	70.630	.....	309.284	.....
December	66.635	.....	68.514	.....	306.994	.....
Year	63.615	.....	65.285	.....	291.016	.....

New York quotations, cents per pound. London, pounds sterling per long ton.

Zinc

	St. Louis		London			
	1926	1927	1926 Spot	1926 3 Mos.	1927 Spot	1927 3 Mos.
January	8.304	6.661	38.059	37.363	30.979	30.938
February	7.759	6.673	36.053	35.956	29.931	30.109
March	7.332	6.692	34.090	34.247	30.649	30.889
April	7.001	6.338	32.503	32.863	29.579	29.901
May	6.821	6.075	32.038	32.413	29.034	29.131
June	7.112	6.213	33.244	33.398	28.598	28.613
July	7.411	6.229	34.045	34.270	28.280	28.021
August	7.376	6.342	34.173	34.524	28.210	28.068
September	7.413	6.212	34.389	34.415	27.347	27.327
October	7.296	5.996	34.256	34.146	26.899	26.634
November	7.199	.....	33.491	33.483	.....	.....
December	7.018	.....	32.915	32.895	.....	.....
Year	7.337	.....	34.105	34.164	.....	.....

St. Louis quotations, cents per pound. London, pounds sterling per long ton

Antimony, Quicksilver and Platinum

	Antimony (a)		Quicksilver (b)		Platinum (c)			
					Refined		Crude	
	New York		New York		New York			
	1926	1927	1926	1927	1926	1927	1926	1927
Jan.	23.490	13.910	87.960	101.200	118.200	109.520	113.200	99.820
Feb.	21.676	14.509	87.580	101.727	113.909	107.545	108.341	99.295
March	19.708	12.801	88.194	110.259	112.000	108.000	106.278	100.426
April	17.462	14.166	89.769	123.250	111.538	101.885	103.731	91.865
May	12.170	12.975	91.365	123.900	108.960	84.680	102.900	75.000
June	11.106	12.447	91.346	118.096	111.000	72.000	106.615	62.500
July	14.490	11.880	90.163	119.880	114.692	72.000	109.000	61.520
Aug.	15.957	11.826	89.260	119.111	116.000	72.000	108.692	62.000
Sept.	15.325	11.073	91.425	119.640	116.840	72.000	108.600	62.000
Oct.	13.943	11.165	97.260	126.200	112.240	72.000	106.000	62.000
Nov.	13.385	.....	99.000	.....	112.000	.....	105.250	.....
Dec.	13.142	.....	99.510	.....	111.846	.....	105.385	.....
Year	15.988	.....	91.903	.....	113.269	.....	106.999	.....

(a) Antimony quotations in cents per pound, for ordinary brands. (b) Quicksilver in dollars per flask of 76 lb. Prior to June, 1927, the unit had been the 75-lb. flask. (c) Platinum in dollars per ounce.

Pig Iron, Pittsburgh; and Aluminum, 98 Per Cent

	Bessemer		Basic		No. 2 Foundry		Aluminum	
	1926	1927	1926	1927	1926	1927	1926	1927
Jan.	22.76	21.04	21.76	20.01	22.26	20.26	27.000	26.270
Feb.	22.76	20.76	21.76	19.76	22.26	20.26	27.000	26.000
March	22.76	21.15	21.76	20.33	22.26	20.26	27.000	26.000
April	21.38	21.26	20.66	20.49	21.05	20.26	27.000	26.000
May	21.12	20.94	19.76	19.96	20.76	20.26	27.000	26.000
June	20.76	20.66	19.76	19.62	19.80	20.11	27.000	26.000
July	20.44	20.26	19.26	19.26	19.49	19.76	27.000	26.000
Aug.	19.87	20.07	19.18	19.01	19.26	19.40	27.000	26.000
Sept.	20.11	19.96	19.26	19.04	19.30	19.46	27.000	26.000
Oct.	20.76	19.76	19.76	18.76	19.97	19.26	27.000	25.600
Nov.	21.90	.....	20.46	.....	20.96	.....	27.000	.....
Dec.	21.26	.....	20.26	.....	20.53	.....	26.934	.....
Year	21.31	.....	20.29	.....	20.64	.....	26.955	.....

Iron in dollars per long ton. Aluminum in cents per lb., 98 per cent grade.

Monthly Crude Copper Output in Short Tons

Domestic

	1927					
	April	May	June	July	Aug.	Sept.
Alaska shipments	2,121	3,045	2,105	2,798	2,138	1,879
Butte & Superior	.....	.....	†453	.....	.....	†284
Calumet & Arizona	1,711	2,422	2,075	1,866	2,577	1,807
Magma	1,232	1,270	1,250	1,066	1,182	1,196
Miami	2,295	2,346	2,176	2,233	2,268	2,008
New Cornelia	2,630	2,776	2,895	2,496	3,039	3,137
Nevada Con.	.....	.....	†27,821	.....	.....	.....
Old Dominion	879	1,030	815	825	850	931
Phelps Dodge††	8,063	7,972	8,085	7,706	7,366	7,779
United Verde Extension	1,630	2,051	1,768	1,868	1,905	1,813
Utah Copper	.....	.....	†30,028	.....	.....	.....
Tennessee Copper	410	433	390	408	445	412

Foreign

Andes Copper Mining Co.	.....	.....	2,495	2,370	2,367	.....
Braden	7,164	7,565	7,447	8,986	8,995	.....
Boleo, Mexico	550	1,017	1,115	1,215	1,067	852
Bwana M'Kubwa	360	515	464	337	366	336
Chile	9,352	9,791	8,988	9,005	9,020	.....
Furukawa, Japan	1,416	1,493	1,569	1,367	1,461	.....
Granby Cons., Canada	2,123	2,989	2,287	2,261	2,261	2,268
Mount Lyell, Aust.	.....	.....	†1,423	.....	.....	†1,515
Sumitomo, Japan	1,388	747	.....	1,693	1,338	.....
Union Miniere, Africa	6,039	7,050	7,004	8,065	8,008	9,075

†Three months.
††Moctezuma is included.

Monthly Production of Primary Copper from U. S. Mines and Daily Rate (Short Tons)

	1925		1926		1927	
	Monthly Production	Daily Rate	Monthly Production	Daily Rate	Monthly Production	Daily Rate
January	74,789	2,412	71,026	2,291	76,198	2,458
February	68,967	2,463	68,131	2,433	69,202	2,472
March	74,901	2,416	75,728	2,443	69,314	2,236
April	70,667	2,356	73,454	2,448	71,122	2,371
May	70,574	2,276	73,542	2,372	71,613	2,310
June	59,894	2,330	71,317	2,377	69,539	2,318
July	68,507	2,210	72,278	2,330	65,545	2,114
August	68,090	2,196	72,014	2,323	67,248	2,169
September	67,720	2,272	72,672	2,421	65,936	2,198
October	71,042	2,292	75,099	2,423	.....	.....
November	67,400	2,247	74,947	2,498	.....	.....
December	69,566	2,244	72,205	2,329	.....	.....
Total	842,117	.....	872,509	.....	625,717	.....
Monthly average	70,176	.....	72,709	.....	69,524	.....
Average of daily rate	.....	2,307	.....	2,390	.....	2,292

Mining Stocks—Week Ended October 29, 1927

Stock	Exch.	High	Low	Last		Last Div.
COPPER						
Anaconda	New York	46¾	46	47	Oc.15, No.21 Q	0.75
Arcadian Consol.	Boston	1¼	*80	1¼		
Ariz. Com'l	Boston	5⅝	5¼	5⅜	Jy. 18, Jy. 30	0.25
Calaveras	N. Y. Curb			1⅞		
Calumet & Arizona	New York	85½	80¾	81¼	Se. 9, Se. 26 Q	1.50
Calumet & Hecla	Boston	16⅞	16¼	16½	Au. 31, Se.15 Q	0.50
Cerro de Pasco	New York	62¾	61⅞	61⅞	Oc.13, No.1 Q	1.00
Chile Copper	New York	34¼	33½	33⅝	De. 2, De. 30,Q	0.62½
Con. Coppermines	N. Y. Curb	4⅛	3⅝	3⅝		
Copper Range	Boston	15¼	14	14¼	Ap.2, My.2, A	1.00
Crystal Copper	BostonCurb	*30	*27	*30		
East Butte	Boston	1⅞	1¼	1½	Dec., 1919	0.50
Granby Consol	New York	34	32	32	Jn.15 Jy. 1 Q	1.00
Greene Cananea	New York	83	74½	77⅝	Nov., 1920	0.50
Howe Sound	New York	37½	35¾	36½	Oc.1, Oc.15, Q	1.00
Inspiration Consol	New York	19½	16⅝	16⅞	Ma.17, Ap.4, Q	0.25
Iron Cap	Boston Curb			1⅜		
Isle Royale	Boston	11½	11⅛	11⅜	Se. 30, Oc. 15, Q	0.50
Kennecott	New York	74½	71⅞	72½	Se. 2, Oc. 1, Q	1.25
Magma Copper	New York	49	45½	46¼	Se.30,Oc.15 Q	0.75
Mason Valley	N. Y. Curb	85	85	85		
Miami Copper	New York	15	14⅜	15	No.1, No.15, Q	0.37½
Mohawk	Boston	46	44	44½	Oc.31, De.1 Q	2.00
Mother Lode Coal	New York	1⅞	1½	1½	Jn.10, Jn.30	0.25
Nevada Consol	New York	16¼	15⅛	15⅛	Se. 16, Se. 30 Q	0.37½
New Cornelia	Boston	23	22⅛	22⅞	No.4, No.21 Q	0.50
Noranda	N. Y. Curb	26⅛	25¼	25⅛		
North Butte	Boston	1	*75	*75	Oct., 1918	0.25
Ohio Copper	N. Y. Curb	1.00	*93	*96	Sept. 1926	0.03
Old Dominion	Boston	10⅛	9½	9¾	Dec., 1918	1.00
Phelps Dodge	N. Y. Curb			118	Se.21, Oc.1 Q	1.50
Quincy	Boston	14¼	13½	13⅞	March, 1920	1.00
Ray Consolidated	New York			15¼	Ap.20, Ap. 30	0.25
St. Mary's Min. Ld.	Boston			24	Fe.10, Ma.10	2.00
Seneca Copper	New York	1¼	1	1		
Shattuck Denn	Boston Curb	6⅞	6½	6⅞		
Tenn. C. & C	New York	8⅞	8⅛	8⅛	Au.31,Se.15, Q	0.12½
United Verde Ex	N. Y. Curb	27¼	26⅞	26⅞	Oc.6, No.1 Q	0.75
Utah Copper	New York			130	Se. 16, Se. 30 Q	1.50
Utah Metal & T	Boston	*92	*80	*80	Dec., 1917	0.30
Walker Mining	Salt Lake	*45	*45	*45		
NICKEL-COPPER						
Internat. Nickel	New York	66	62⅜	63	Se. 16, Se. 30 Q	0.50
Internat. Nickel pfd.	New York			109	Oc. 13, No. 1 Q	1.50
LEAD						
Gladstone Mtn	Spokane	*15	*14¾	*15	June, 1927	0.005
National Lead	New York	117	111½	112	Se. 16, Se. 30 Q	1.25
National Lead pfd	New York	112⅛	112½	112½	De.2, De. 15 Q	1.75
St. Joseph Lead	New York	37⅛	37¼	37⅜	De.10,De.20,QX	0.75
ZINC						
Am. Z. L. & S	New York	6½	6	6	May, 1917	1.00
Am. Z. L. & S. pfd.	New York	39½	37½	37⅝	Nov., 1920	1.50
Butte C. & Z	New York	4	4	4	De. 9, De. 24	0.50
Butte & Superior	New York	8⅝	8¼	8¼	Se. 16, Se. 30 Q	0.50
Callahan Zn-Ld	New York	1⅜	1¼	1⅜	Dec., 1920	0.50
Consol.Lead&Zinc'A'	St. Louis			11⅜	Ma.15, Ap.1 Q	0.25
Eagle-Picher	Cincinnati	24½	24	24½	No.15, De.1 Q	0.40
Eagle-Picher pfd	Cincinnati			117½	Jn.30, Oc.15 Q	1.50
New Jersey Zn	N. Y. Curb	182½	180	182	No. 19, De. 10 X	2.00
United Zinc	N. Y. Curb			*55		
Yellow Pine	Los Angeles	*35	*35	*35	Dec. 1925 Q	0.04
GOLD						
Alaska Juneau	New York	1⅛	1⅛	1⅛		
Argonaut	Toronto	*41	*37	*37½		
Barry-Hollinger	Toronto	*94½	*91	*94½		
Con.W.Dome L.new.	Toronto	*16½	*16	*16		
Cresson Consol. G	N. Y. Curb	1⅛	1⅛	1⅛	Se. 30, Oc.10 Q	0.10
Dome Mines	New York	11	10	10	Se.30, Oc.20 Q	0.75
Golden Cycle	Colo.Springs	†1.77	†1.75		Au.30, Se.10 Q	0.04
Hollinger Consol	Toronto	17.45	17.00	17.05	Oc. 19, No. 4	0.10
Homestake Mining	New York	75	71	71	Oc.20, Oc. 25 M	0.50
Kirkland Lake	Toronto	2.67	2.30	2.54		
Lake Shore	Toronto	27.10	26.50	26.70	Se 1, Se.15 X	0.20
McIntyre-Porcupine	New York			28½	No.1, De.1 Q	0.25
Portland	Colo.Springs	†*25	†*22½		Ap.6, Ap.15, Q	0.02
Rand Mines	New York			48½	Au.22-29 Am.£h.1	1.52
Teck-Hughes	Toronto	10.90	10.05	10.60	Jy.21, Au.1	0.10
Tom Reed	Los Angeles	*40	*39½	*40	Dec., 1926	0.02
Tough-Oakes	Toronto	*62	*56	*59½		
United Eastern	N. Y. Curb	*48	*46	*48	July, 1924	0.05
Vipond Cons	Toronto	*62	*57	*57	Apr.1, Apr.15	0.03
Wright-Hargreaves	Toronto	7.60	7.25	7.40	Oc.17, No.1	0.05
GOLD AND SILVER						
Carnegie Metals	Pittsburgh	12	12	12		
Con. Cortez	N. Y. Curb			*23		
Dolores Esperanza	N. Y. Curb			*48	July, 1923	0.05
Premier Gold	N. Y. Curb	2¼	2 3/16	2⅛	Se. 15, Oc. 4	0.08
Tonopah Belmont	N. Y. Curb			1⅛	Ma.15, Ap.4	0.08
Tonopah Extension	N. Y. Curb	*15	*10	*11	Apr. 1925	0.05
Tonopah Mining	N. Y. Curb			1⅞	Se.20, Oc.21	0.07½
West End Consol	N. Y. Curb			*7	Mar., 1923	0.05
Yukon Gold	N. Y. Curb	*40	*40	*40	June, 1918	0.02
SILVER						
Beaver Consol	Toronto	1.95	1.75	1.85	May, 1920	0.03
Castle-Trethewey	Toronto	*85	*77½	*80		
Coniagas	Toronto	4.55	4.55	4.55	May, 1924	0.12½
Keeley	Toronto	*84	*80	*80	Se.1, Se.15	0.08
Lorrain Trout Lake	Toronto			*60	July, 1925	0.05
McKinley-Dar.-Sav	Toronto	*17½	*17	*17	Oct., 1920	0.03
Mining Corp. Can	Toronto.	4.08	3.50	3.64	Jn. 29, Jy.15	0.12½
Nipissing	N. Y. Curb.	7¼	7⅛	7⅛	Se.30, Oc.20 Q	0.07½

Stock	Exch.	High	Low	Last		Last Div.
SILVER-LEAD						
Ahumada	New York	3¾	3⅛	3⅜	Ma. 25,Ap.4,QX	0.12½
Bingham Mines	Boston	58½	56¾	55⅜	Se.24, Oc.5 Q	1.00
BunkerHill&Sullivan	N. Y. Curb	130	124¾	124⅝	Jy. 30, Au.4 X	0.75
Cardiff M. & M	Salt Lake	1.25	81	83	Feb. 5, 1927	0.10
Chief Consol	Salt Lake	1.95	1.95	1.95	Nov., 1926 Q	0.10
Consti'nMng.&Mill'g	Spokane	*20	*15	*15		
Erupcion	Boston Curb	*61	*60	*60	Se. 15, Oc 3 Q	0.07½
Eureka Lily	Salt Lake	1.30	1.17½	1.27½		
Federal M. & S	New York	125	125	125	Jn.25, Jn.29	Spec.$10
Federal M. & S pfd.	New York	94½	93½	93½	Au. 25, Se.15 Q	1.75
Hecla Mining	N. Y. Curb	16⅝	16	16	Au. 15 Se 15 Q	0.25
Highland-Surprise	Spokane	*11⅜	*11	*11¼		
Iron King Mining	Salt Lake	*50	*49½	*49½		
Keystone Mining	Salt Lake			*21	Au. 12, Au. 26	0.07½
Lucky Jim	Spokane	*32	*31½	*32		
Lucky Tiger-Com	Kansas City	†6.90	†6 80		Oc.10, Oc. 20	0.05
Mammoth Mining	Salt Lake			1.40	Jn.10, Jn.20 Q	0.05
Marsh Mines	Spokane	*75	*75	*75		
North Lily	Salt Lake	3.15	2.95	3.15		
Park Utah	New York	7¼	7	7⅛	Se. 15, Oc. 1 Q	0.20
Plutus Mining	Salt Lake			1.50	Oc. 25, No. 10 Q	0.10
San Rafael	San Fran.	*8⅛	*7½	*8⅛		
Silver King Coal	Salt Lake	9.30	9.25	9.30	Se. 20, Oc. 1 Q	0.25
Silversmith	Spokane	*17	*13½	*17	Oct., 1926 Q	0.02
Strattons Mines	Spokane	*49½	*47½	*47½		
Sunshine M. Co	Spokane	1.25	1.10	1.15		
Tamarack-Custer	Spokane	*30	*26	*29½	Sept., 1924	0.25
Tintic Standard	Salt Lake	12.50	12.00	12.50	Se.15, Se.29 QX	0.40
Utah-Apex	Boston	4⅞	4⅞	4⅛	Oct., 1926	0.25
IRON						
Bethlehem Steel	New York	53¾	48⅝	48¾	Se. 2, Oc. 1,	1.75
Cleveland-Cliffs Iron	Cleveland	101	95	99	Oc. 15, Oc. 25 Q	1.00
Colorado Fuel & Iron	New York	80⅜	66½	68	May, 1921	0.75
Gt. North'n Iron Ore	New York	97	94⅜	94⅜	Dec. 6, Dec. 28	0.75
Inland Steel	New York	51	50	51	No. 15, De. 1 Q	0.62½
Replogle Steel	New York			12¼		
Republic I. & S	New York	57⅛	53	53½	No. 15, De.1 Q	1.00
Republic I. & S. pfd.	New York	100	98¼	98½	De. 14, Ja. 2 Q	1.75
Sloss-Sheffield S. & I.	New York	116	113	113	Se. 10, Se. 20 Q	1.50
Sloss-Shef. S.&I. pfd.	New York	104½	104½	104½	Se. 20, Oc. 1 Q	1.75
U. S. Steel	New York	139½	128⅝	128⅞	No. 30, De. 30 Q	1.75
U. S. Steel, pfd.	New York	138⅛	137⅛	137⅛	Oc 30, No. 29 Q	1.75
Virginia I. C. & C	New York	40⅛	40	40⅛	Jan., 1924	1.50
Virginia I C &C. pfd.	New York			60½	Ju. 15, Jy. 1	2.50
DIAMONDS, PLATINUM, ALUMINUM, VANADIUM, TIN						
De Beers Consol	New York			27½	Jn. 26, Jn.30	1.45
So. Am. G. & P. New.	N. Y. Curb	2¾	2½	2⅝		
Alum. Co. of Amer	N. Y. Curb	97	96¼	96½		
Alum. Co. of Amer.pf.	N. Y. Curb	104	104	104	Se. 15, Oc 1 Q	1.50
Vanadium Corp	New York	53	51¼	51⅛	No. 1, No. 15 Q	0.75
Patino M. & E	New York	20⅞	20	20	Ap. 27, My. 5	1 sh.
ASBESTOS						
Asbestos Corp	Montreal	38	37	37½	Jan., 1926	1.50
Asbestos Corp. pfd	Montreal	95	94	94¾	Se.30, Oc.15 Q	1.75
SULPHUR						
Freeport, Texas	New York	93¾	85¾	88⅜	Oc.15, No.1 QX	1.50
Texas Gulf	New York	72	67	67⅛	Ju. 1, Ju. 15 Q	1.00
MINING, SMELTING, REFINING AND GENERAL						
Amer. Metal	New York	41¼	40¼	40¼	No.19, De.1 Q	0.75
Amer. Metal, pfd	New York			110	No.19, De.1 Q	1.75
Amer. Sm. & Ref	New York	165½	158¼	159½	Oc.14, No. 1 Q	2.00
Amer. Sm. & Ref. pfd.	New York	130⅜	129	130⅜	No., Dec. Q	1.75
Consol. M. & S	Montreal	252½	242	247	Jn. 30, Jy. 15 X	6.25
Newmont Mining	N. Y. Curb	104	99	99	Se.30, Oc.15 Q	1.00
U. S. Sm. R. & M	New York	38½	36½	36½	Oc. 6, Oc. 15 Q	0.87½
U.S. Sm. R.&M. pfd.	New York	49⅛	49	49	Oc. 6, Oc. 15 Q	0.87½

* Cents per share. † Bid or asked. Q, Quarterly. SA, Semi-annually. M, Monthly. F, four weeks. I, Initial. X, Includes extra. The first date given is that of the closing of the books; the second that of the payment of the dividend.

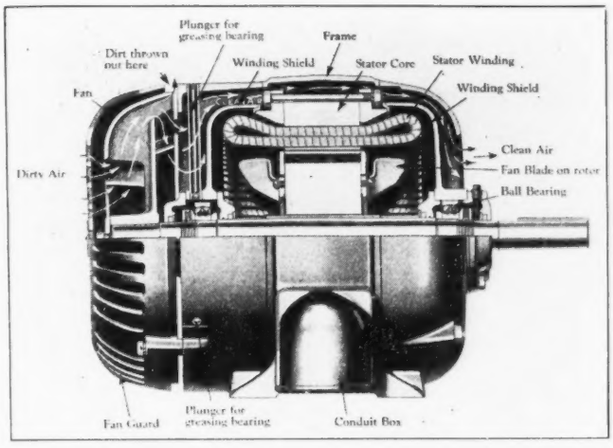
Boston quotations courtesy Boston Stock Exchange; Toronto quotations those of the Standard Stock Exchange of Toronto, by courtesy of Arthur E. Moysey & Co.; Spokane, Pohlman Investment Co.; Salt Lake, J. A. Hogle & Co.; Colorado Springs, Colo., Henry Sachs.

LONDON QUOTATIONS—WEEK ENDED OCT. 18, 1927

Name	High	Low	Last	Date	Amount	Last Div.
Aramayo Mines (25 frs.)	75/7½	73/9	75/—	Aug., 1927	5	p.c. (†)
British Platinum (£1)	—/9	—/3	—/3	Feb., 1925	2½	p.c.
Burma Corpn. (10 rupees)	13 1½	12/6	12/10½	Aug., 1927	6	annas*
Bwana M'Kubwa (5s)	5/3	4/10½	5/—			
Camp Bird (2s)	4/10½	3/4½	3/9			
El Oro (£1)	3/9	3/6	3/9	Nov., 1924	2½	p.c.*
Esperanza (10s)	—/2	—/2	—/2			
Frontino & Bolivia (£1)	13/9	13/3	13/9	July, 1927	5	p.c.
Mexican Corpn. (£1)	7/6	6/—	7/6			
Mexico Mines of El Oro (£1)	17/6	13/9	17/6	Dec., 1926	3¾	p.c.*
N'Changa Copper Mining	15/—	14/—	15/—			
Oroville Dredging (£1)	6/3	5/7½	6/3	Dec., 1923	3¾	p.c.
Ouro Preto (£1)	2/6	2/—	2/6	May, 1925	2½	p.c.
Rhodesian Congo Border (£1)	35/7½	31/10½	32/6			
St. John del Rey (£1)	11/—	10/6	10/9	May, 1927	3¾	p.c.
San Francisco Mines (10s)	28/9	26/9	28/3	July, 1927	15s.	
Santa Gertrudis (£1)	17/10½	17/1½	17/6	July, 1927	7½	p.c
Selukwe (2s. 6d.)	7/6	6/10½	7/—	April, 1917	6¼	p.c
S. Amer. Copper (2s.)	2/—	1/6	2/—	Nov., 1917	75	p.c
Tanganyika (£1)	65/—	59/7½	61/3	Aug., 1927	7½	p.c.
Union Miniere du Haut-Katanga (Brussels)	9.710	9.450	9.710	July, 1927	182.60	(‡)

* Free of British income tax. † Swiss francs and plus 15 p. c. bonus. ‡ Belgian frs. and free of taxation.

Industrial Progress



Left, the windings of this ball-bearing motor are totally inclosed with shields. The fan is designed so as to throw dust and dirt out of the air by centrifugal action. It is protected by a perforated guard, as shown.

Progress in Electric Motor Design

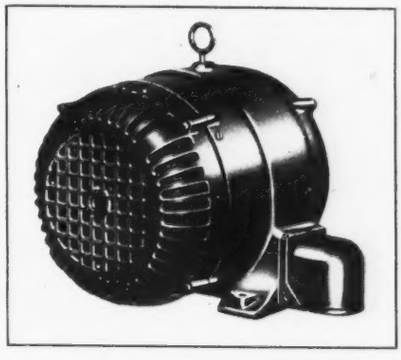
THE answer to the demand for an inclosed motor of satisfactory design appears to lie in the recent development of inclosed self-ventilated types in which the windings are entirely protected from the air currents. Several developments are to be noted in this type of device. Fairbanks, Morse & Co. has recently introduced a line of self-ventilated inclosed motors which also have an interesting air-cleaner feature. The accompanying sectional view shows the construction clearly.

This motor has a standard stator core and windings and a standard rotor mounted in a supporting shell with an annular air passage between the outside surface of the stator core and the shell. Winding shields are provided so that the stator windings are totally inclosed, thereby preventing any dirt from gaining access to these windings. Cooling air is drawn through an inlet opening at the free end of the motor by means of a fan of special type which also functions as an air cleaner. The clean air is blown across the winding shield at the free end of the motor, through the annular air space, then across the outer end of the stator core laminations, thence across the winding shield at the pulley end and out through openings in the pulley-end bearing arm.

The fan is of the closed-impeller type and is so constructed that the foreign particles are thrown out by centrifugal force, between the edge of the outer shroud and the supporting frame. A perforated guard is placed around this fan-cleaner and is carried by the supporting frame. The whole purpose of this guard is to prevent accidental contact with the fan, the fan itself being an entirely self-contained air cleaner and blower.

Provision is made for lubricating the ball bearings of this motor without removing the guard, fan, or bearing arms. This is accomplished by the use of a plunger device located in a grease tube extending through an opening in the bearing arm into the bearing housing.

Another motor development of recent years has been what is known as the



External view of the inclosed self-ventilated motor shown in the cut above. Lubrication is effected by a plunger in a grease tube.

double-squirrel cage type. In this motor two sets of bars are placed in the rotor, each set being connected with its own end rings. The low-resistance bars in this case are placed in comparatively deep slots in the rotor and the higher resistance bars in comparatively shallow slots. The inner low-resistance winding in the iron rotor core chokes the current in this winding at starting and forces it to flow in the outer high-resistance winding, thereby producing high starting torque with comparatively low starting current. After the motor has accelerated and is carrying normal load, the low resistance winding carries the greater portion of the current, but owing to its position in the rotor core the power factor and maximum torque are less than with a standard or single squirrel-cage winding.

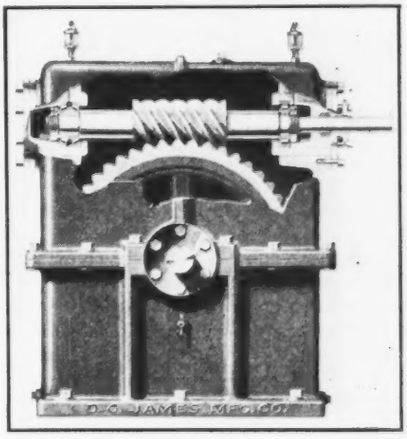
The most recent development in a double-squirrel cage motor is that of the Fairbanks, Morse company in a motor which is called a variable leakage, double-squirrel-cage type. In this motor the current in the inner winding at starting is choked by means of movable iron rods. These rods are placed in each rotor slot between the inner and outer bars. The instant the motor is connected to the line the iron rods are pulled down toward the inner bars, closing the small leakage gap in the rotor iron, which almost completely chokes the current in the inner low-resistance winding by forming a complete iron circuit around each inner bar. This choking action on the inner winding forces practically all of the current to flow in the outer high-resistance winding at starting, thus producing a high starting torque with a low starting current.

As the rotor accelerates, the iron rods are thrown out of the leakage gaps by centrifugal force, which removes the choking effects from the inner winding when the motor is running. This results in a much better running performance than is possible with the older style of double-squirrel-cage motor. It is also possible to use much higher resistance in the outer winding where exceptionally low starting current is desired and where the starting torque requirements are moderate. At the start, the rods in changing position make a slight noise.

Worm Gear Speed Reducer Built for Long Life

In the new heavy-duty worm gear speed reducer, announced by the D. O. James Manufacturing Co., Chicago, there are used phosphor bronze gears, chrome-nickel steel worms, Timken and Norma Hoffman roller bearings, interchangeable bushings, 0.4 carbon steel gear shafts, and gray-iron housings.

The large oil-cooling chamber prevents overheating, and an oil-level cock fitted into the side of the housing guards against over-oiling, a condition just as serious as under-oiling. A large heat radiating and oil-cooling space in the housing keeps the oil at a low, even temperature.



Phosphor bronze and chrome-nickel steel are used in this reducer

New Water Column and Inclined Gage Developed for Boilers

THE boiler-water column and the inclined water gage illustrated are a recent development of the Yarnall-Waring Co., Philadelphia. The column, known as the Yarway, is available in three types to cover a complete pressure range up to 650-lb. boiler pressure. It is furnished with a high- and low-water alarm as standard equipment.

The inclined water gage, which carries the trade name "Secure," is also standard equipment. The gage has been purposely designed as an independent unit, however, so it can be furnished for any make of water column now in service or used to improve visibility over that possible through the use of the usual vertical water gage on over-head liquid containers both in and out of the power house.

The column body is forged for a solid steel billet. Its outside diameter is that of standard 6-in. pipe. The wall thickness is approximately ¾ in. The forging has been made of ample length to provide for settlement space below the lower water connection. It is made straight in section to provide for uniform strength and to eliminate any constriction above the sediment space.

The blow-down line is threaded into the bottom of the column forging, and, when so specified, is fitted with the Yarway union seatless column blowdown valve as shown. At the top, the column is fitted with a pair of steel flanges that are forged from the solid. The lower flange is threaded in place. The upper flange is machined to make a captured joint against the column wall.

For pressures to include 250 lb., the boiler connections are threaded. Above this pressure flanged fittings, as illustrated, are forged from the solid, are shoulder threaded into the column, and are then permanently arc welded.

The general arrangement of the high- and low-water alarm is shown in the line cut, and that part of the alarm mechanism from the balance levers upward has been disassembled and photographed to show the construction in detail. Cast-iron weights operate the alarm on the displacement principle to obviate any possible danger of failure to hollow floats. These weights hang respectively from opposite ends of both levers, so that their vertical movement imparts a rocking motion to the levers without any off-center strain. This motion is, in turn, communicated to the valve stem to open and close the alarm valve. The suspending rods, lever pins, and the lever fulcrum are of stainless steel; the levers, the valve stem, and the valve sleeve are of hydraulic bronze. The valve sleeve which supports the mechanism is screwed into the upper column flange, so that this complete mechanism can be lifted from the column as a unit. A ring is provided in this flange to assist in assembly and removal. The sleeve projects above the top flange to bring the removable valve pin and seat outside of the column assembly for ready inspection.

The valve stem is guided by a bronze bushing which rests on top of the main sleeve; and the stem carries a hardened nickel-steel pin that has been ground to fit into the valve disk, which latter is set on top of, and is also guided in, the bushing. Both pin and disk are reversible. Disk and bushing are held in place by means of a cap that screws down over the sleeve. It is only necessary to remove this cap to inspect or renew the valve disk and pin.

An alarm whistle, furnished as standard equipment, screws into the valve cap. The company is prepared to furnish this cap with a side outlet as illustrated, to which a mercoid switch will be attached when so specified. This type of switch is fully insulated from the column, so there is no danger of ground or electrolytic action. It is intended to be connected to warning lights on the firing-floor level, on the boiler control panel, or in the engineer's office, or to recording instruments conveniently located to preserve a record of water-level fluctuations over a period of time.

The water gage is fitted to the column with screwed connections for pressures up to 250 lb. and with flanged fittings above this point. All parts of the gage are made of hydraulic bronze and when flanged are secured to the column with special heat-treated studs.

The type of gage that is designed for the heavy pressures is constructed, as illustrated, so there will be a slight incline downward in the upper leg toward the column. This incline, together with a bronze baffle built into the fitting above the glass, leads condensate back to the column that will otherwise run into and score the steam portion of the glass. The gage is regularly provided with the glass as shown for the high pressures, but when specified prismatic glass will be supplied. The standard glass can be assembled or withdrawn through the top fitting, and when in place has amply long bearing both above and below. An important feature of the whole assembly is that the glass and column lie in line with each other.

In accordance with standard practice, the column is drilled on both sides for the try cocks, so that they can be assembled for either hand.

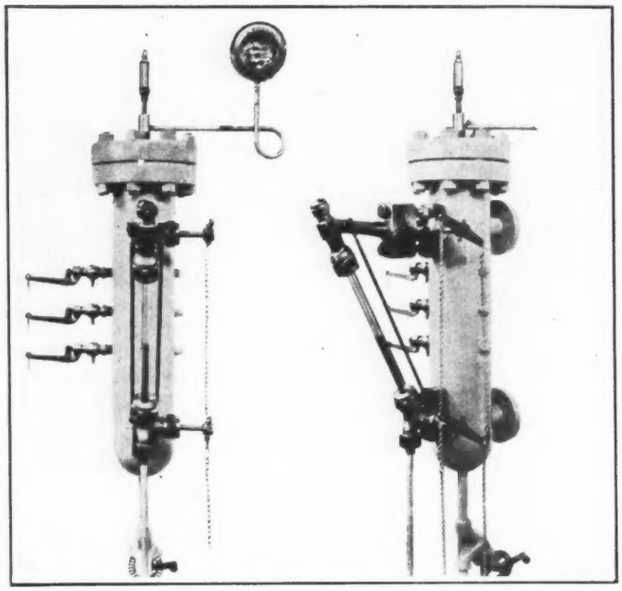


Fig. 1—Front and side views of water column with inclined gage-glass, high- and low-water alarm and mercoid switch

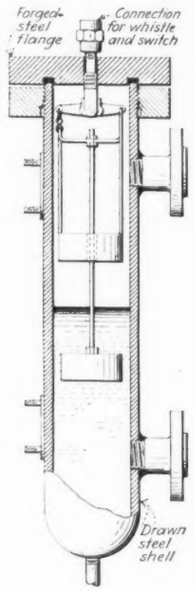


Fig. 2—Method of suspending valve-operating weights in water column

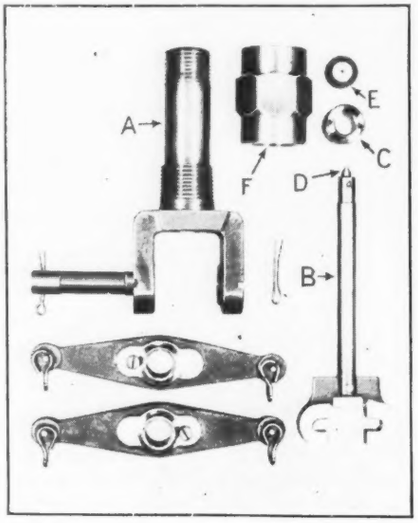


Fig. 3—Disassembled view of alarm-valve operating mechanism

CATALOGS

USED EQUIPMENT—Hyman Michaels Co., of Chicago. Bulletin 130. New and used equipment of all kinds.